ACOPOSmulti
User´s Manual

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ACOPOSmulti

User's Manual

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Chapter 1 • General information

1. Manual history

Version	Date	Comment
0.10 Preliminary	16.03.2006	Changes / new features • First version.
0.20 Preliminary	16.03.2006	Changes / new features • Pin assignments for the line filter and regeneration choke added • Pins assignments for additional auxiliary power supplies added • Safety guidelines updated to include guidelines for handling ESD
0.21 Preliminary	30.03.2006	Changes / new features • "Preliminary" deleted except in the manual history • Images of the plug used for 8BVF.... changed (coding was not shown correctly)
0.22 Preliminary	16.05.2006	Changes / new features • Dummy chapter with technical data added • Wiring: New overview images added, previous overview images deleted
0.23 Preliminary	19.05.2006	Changes / new features • Order data in chapter 2 updated Required and optional accessories added • Overview images revised in chapter 5
0.24 Preliminary	04.07.2006	Changes / new features • Additional shielding component set added (8SCS005.0000-00) • Model numbers for plugs: 8TB3104.201A-00 --> 8TB3104.201A-10 8TB4104.202D-00 --> 8TB4104.206D-10 8TB4104.202N-00 --> 8TB4104.202N-10 • Technical data from exhibition brochures added • Technical data: Layout changes made to the required optional accessories • Auxiliary supply modules: New coding for X3 plug
0.25 Preliminary	06.07.2006	Changes / new features • Auxiliary supply modules: Numbering in the overview diagram for X3 plug corrected
0.26 Preliminary	18.07.2006	Changes / new features • Technical data: Revisions according to PA and discussion on July 05, 2006 New: EnDat plug-in module according to PA New: Distribution of inverter modules according to PA New: Additional auxiliary supply modules according to PA New: Additional power supply modules according to PA

Table 1: Manual history

Version	Date	Comment
0.27 Preliminary	xx.08.2006	Changes / new features • Technical data: Revisions according to PA and Bernd on 04.08.06 Additional plug-in modules: EnDat 2.1, EnDat 2.2, SinCos Inverter modules: Distribution of single and double-axis modules in different sections
0.28 Preliminary	xx.09.2006	Changes / new features • Pin assignments: Additional plug-in modules: EnDat 2.1, EnDat 2.2, SinCos
0.29 Preliminary	xx.11.2006	Changes / new features • Technical data for inverter modules: Cable length depending on the switching frequency • Module images added • Cross references from modules to plug-in modules • Installation diagrams for mounting plate wall mounting • Weights/dimensions updated for line filter and regeneration choke • Figure index, Table index and Model number index added
0.30 Preliminary	31.01.2007	Changes / new features • Installation: Installation diagrams for inverter module wall mounting • Wiring: Insulation and high voltage test • Wiring of plug-in modules: Inner connection updated • Technical data: Indicator descriptions and LED status updated • Dimensioning: Power connection updated • Technical data, regeneration choke: Screw connector added • Technical data, inverter modules: Nominal currents and derating updated (8BVI0014, 8BVI0028, 8BVI0055) • Technical data, auxiliary supply modules: Peak current (>4 s) 24 VDC internal system supply voltage changed • Technical data, inverter: Dependency of the motor cable length on the switching frequency documented • Technical data, regeneration chokes: 8BVR0880H000.100-1 updated • Technical data, line filter: 8BVF0880H000.000-1 updated • Dimension diagrams and installation dimensions, wiring for regeneration chokes: 8BVR0880H000.100-1 updated • Dimension diagrams and installation dimensions, wiring for line filter: 8BVF0880H000.000-1 updated • Plug-in module pin assignments: Plug name changed from X1 to X11 • Fan module pin assignments added

Table 1: Manual history (cont.)

Version	Date	Comment
0.31 Preliminary	11.05.2007	Changes / new features • Wiring of 8B0C0160HC00.A05-1: Pin 4 of X2 connection wired incorrectly (+42V) --> corrected to +24V • Technical data / wiring: HIPERFACE plug-in module 8BAC0121.000-1 added • Wiring / 8BAC0124.000-1 Inner connection modified / corrected • Technical data 8BVI0440HxS0.000-1 / Required accessories: Model number of plug for X5 connection added • Wiring: Section "Wired safety technology" added • Wiring: Section "Overview of the terminal cross sections" added • Wiring / General information: Section "General information" updated (shielding) • Technical data for 8BVI..., 8BVP... Electrical isolation of trigger inputs (8BVP, 8BVI) / Enable inputs (8BVP) corrected • Technical data / wiring / mounting of 8BVR0440: Changeover to 8BVR0110H000.100-1 and 8BVR0440H000.100-1 • Wiring of 8BVP0880 / 8BVI0880: Mounting instructions added for X5 connection • Wiring / General information: Section "General information" updated (shielding) • Technical data for 8BAC0120 / 0121 / 0122 / 0124: Corrections / updates made to the technical data. • Technical data for 8B0MxxxxHWxx / Dimensions: Calculation of the width of the mounting plates modified/simplified • Mounting / Wall mounting: Diagrams modified according to the change in width of the mounting plates (n * 53.5 mm) • General information / Safety notices: The term "Servo drive" replaced with "drive system". • Mounting / Cold-plate mounting, wall mounting: Diagrams adjusted (calculation of the width of the mounting plates)

Table 1: Manual history (cont.)

Information:

B&R does its best to keep the printed versions of its user's manuals as current as possible. However, any newer versions of the User's Manual are always available for downloaded in electronic form (PDF) from the B&R homepage www.br-automation.com.

2. Safety guidelines

2.1 General information

B&R drive systems and servo motors have been designed, developed and manufactured for conventional use in industry. They were not designed, developed, and manufactured for any use involving serious risks or hazards that could lead to death, injury, serious physical damage, or loss of any kind without the implementation of exceptionally stringent safety precautions.
Such risks include in particular the use of these devices to monitor nuclear reactions in nuclear power plants, as well as flight control systems, flight safety, the control of mass transportation systems, medical life support systems, and the control of weapons systems.

Danger!

Drive systems and servo motors can have bare parts with voltages applied (e. g. terminals) or hot surfaces. Additional sources of danger result from moving machine parts. Improperly removing the required covers, inappropriate use, incorrect installation or incorrect operation can result in severe personal injury or damage to property.

All tasks, such as transport, installation, commissioning and service, are only permitted to be carried out by qualified personnel. Qualified personnel are persons familiar with transport, mounting, installation, commissioning and operation of the product and have the respective qualifications (e. g. IEC 60364). National accident prevention guidelines must be followed.

The safety guidelines, connection descriptions (type plate and documentation), and limit values listed in the technical data are to be read carefully before installation and commissioning and must be observed.

Danger!

Handling drive systems and servo motors incorrectly can cause severe personal injury or damage to property!

2.2 Intended use

Servo drives are components designed to be installed in electrical systems or machines. They are not being used as intended unless the machine meets EG regulation 98/37/EG (machine regulation) as well as regulation 89/336/EWG (EMC regulation).

Drive systems are only permitted to be operated directly on grounded, three-phase industrial mains (TN, TT power mains). When using them in living areas, shops and small businesses, additional filtering measures must be implemented by the user.

Danger!

Drive systems are not permitted to be operated directly on IT and TN-S mains with a grounded phase conductor and protective ground conductor!

The technical data as well as the values for connection and environmental specifications can be found on the type plate and in the user's manual. The connection and environmental specifications must be met!

Danger!

Electronic devices are generally not failsafe. If the drive systems fails, the user is responsible for making sure that the motor is placed in a secure state.

2.3 Protection against electrostatic discharges

Electrical components that are vulnerable to electrostatic discharge (ESD) must be handled accordingly.

2.3.1 Packaging

Electrical components with housing do not require special ESD packaging, but must be handled properly (see "Electrical components with housing").

Electrical components with housing must be protected by ESD-suitable packaging.

2.3.2 Guidelines for proper ESD handling

Electrical components with housing

- Do not touch the contacts of connectors on connected cables.
- Do not touch the contact tips on the circuit boards.

Electrical components without housing

In addition to "Electrical components with housing", the following also applies:

- Any persons handling electrical components or devices that will be installed in the electrical components must be grounded.
- Components can only be touched on the small sides or on the front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.).
  Metallic surfaces are not suitable storage surfaces!
- Electrostatic discharges should be avoided on the components (e.g. through charged plastics).
- A minimum distance of 10 cm must be kept from monitors and TV sets.
- Measurement devices and equipment must be grounded.
- Measurement probes on potential-free measurement devices must be discharged on sufficiently grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly integrated at B&R (conductive floors, footwear, arm bands, etc.).
- The increased ESD protective measures for individual components are not necessary for our customers for handling B&R products.

2.4 Transport and storage

During transport and storage, devices must be protected from excessive stress (mechanical load, temperature, humidity, aggressive atmosphere, etc.).

Drive systems contain components sensitive to electrostatic charges which can be damaged by inappropriate handling. It is therefore necessary to provide the required safety precautions against electrostatic discharges during installation or removal of drive systems.

2.5 Installation

The installation must take place according to the user's manual using suitable equipment and tools.

Devices may only be installed without voltage applied and by qualified personnel. Before installation, voltage to the switching cabinet should be switched off and prevented from being switched on again.

The general safety regulations and national accident prevention guidelines (e. g. VBG 4) must be observed when working with high voltage systems.

The electrical installation must be carried out according to the relevant guidelines (e. g. line cross section, fuse, protective ground connection, also see chapter 4 "Dimensioning").

2.6 Operation

2.6.1 Protection against touching electrical parts

Danger!

To operate drive systems, it is necessary for certain parts to carry dangerous voltages over 42 VDC. A life-threatening electrical shock could occur if you come into contact with these parts. This could result in death, severe injury, or material damage.

Before turning on a drive system, make sure that the housing is properly connected to ground (PE rail). The ground connection must be made, even when testing the drive system or when operating it for a short time!

Before turning the device on, make sure that all voltage-carrying parts are securely covered. During operation, all covers and switching cabinet doors must remain closed.

Danger!

If an application uses safety functions integrated in the drive system, then the safety functions must be fully validated before being turned on for the first time. This could result in death, severe injury, or material damage.

Control and high power contacts can have voltage applied, even when the motor is not turning. Touching the contacts when the device is switched on is not permitted.

Before working on drive systems, they must be disconnected from the power mains and prevented from being switched on again.

Danger!

Dangerously High Voltage

Before beginning work, remove the supply voltage and wait 5 minutes to ensure that the capacitors have discharged. Be sure to follow the regulations!

The connections for the signal voltages (5 to 30 V) found on the drive system are isolated circuits. Therefore, the signal voltage connections and interfaces are only permitted to be connected to devices or electrical components with sufficient isolation according to IEC 60364-4-41 or EN 50178 and which correspond to SELV / PELV.

Never remove the electrical connections from the drive system with voltage applied. In unfavorable conditions, arcs can occur causing personal injury and damage to contacts.

2.6.2 Protection from dangerous movements

Danger!

Incorrect control of motors can cause unwanted and dangerous movements! Such incorrect behavior can have various causes:

- **Incorrect installation or an error when handling the components**
- **Incorrect or incomplete wiring**
- **Defective devices (drive system, motor, position encoder, cable, brake)**
- **Incorrect control (e. g. caused by software error)**

Some of these causes can be recognized and prevented by the drive system using internal monitoring. However, it is generally possible for the motor shaft to move every time the device is switched on! Therefore protection of personnel and the machine can only be guaranteed using higher level safety precautions.

The movement area of machines must be protected to prevent accidental access. This type of protection can be obtained by using stabile mechanical protection such as protective covers, protective fences, protective gates or photocells.

Removing, bridging or bypassing these safety features and entering the movement area is prohibited.

A sufficient number of emergency stop switches are to be installed directly next to the machine. The emergency stop equipment must be checked before commissioning the machine.

Remove shaft keys on free running motors or prevent them from being catapulted.

The holding brake built into the motors cannot prevent hoists from allowing the load to sink.

2.7 Organization of safety notices

The safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Warning!	Disregarding the safety regulations and guidelines can result in severe injury or major damage to material.
Caution!	Disregarding the safety regulations and guidelines can result in injury or damage to material.
Information:	Important information for preventing errors.

Table 2: Description of the Safety Guidelines

Chapter 2 • Technical data

1. Configuration of an ACOPOSmulti drive system

The ACOPOSmulti drive system consists of a mounting plate, different modules (power supply, auxiliary supply and inverter modules) as well as a line filter and a regeneration choke.

The configuration significantly depends on the following factors:

- Cooling method
- Mean and maximum total power of the inverter and the peripheral supply (e.g. PLC, actuators, motor holding brakes, sensors)
- Mean and maximum power and current of the individual drive units (motors)

The configuration of an ACOPOSmulti drive system is done in 9 steps:

1) Determe cooling method
2) Determine the supply voltage range
3) Select the ACOPOSmulti inverter modules according to application requirements
4) Select the ACOPOSmulti plug-in modules for motor encoder and external axis encoder according to the application requirements
5) If the ACOPOSmulti drive system should be expandable: Determine the number of additional slots for other ACOPOSmulti modules
6) Select the ACOPOSmulti power supply module based on the total power required for the ACOPOSmulti inverter modules (with a mains supply voltage of 3 x 220 VAC, select the next larger power supply module)
7) Select the ACOPOSmulti auxiliary supply module based on the total power required for the ACOPOSmulti inverter modules as well as the peripheral supply (e.g. PLC, actuators, motor holding brakes, sensors)
8) Determine the total number of slots by adding the width units of all modules (including optional slots)
9) Select the appropriate ACOPOSmulti mounting plate according to the total number of slots

2. Indications

The indicators are located on the black cover of the respective ACOPOSmulti module.

2.1 8BVP power supply modules

Image	Indicator group	Label	Color	Function
	Ethernet POWERLINK	R/E	Green/red	Ready/Error
		L/D1	Green	Link / Data activity Port 1
		L/D2	Green	Link / Data activity Port 2
	Inverter - Power	RDY	Green	Ready
		RUN	Orange	Run
		ERR	Red	Error
	Supply voltage	24V	Green	24 V OK
	Encoder slot 1	UP	Orange	Encoder direction of rotation +
		DN	Orange	Encoder direction of rotation -
	Encoder slot 2	UP	Orange	Encoder direction of rotation +
		DN	Orange	Encoder direction of rotation -

Table 3: Status LEDs, 8BVP power supply modules

2.1.1 LED Status

Indicator group	Label	Function	Description
Ethernet POWERLINK	R/E	Ready/Error	see LED status ETHERNET Powerlink
	L/D1	Link / Data activity Port 1	
	L/D2	Link / Data activity Port 2	
Inverter - Power	RDY	Ready	The module is operational and the power stage can be enabled (operating system present and booted, no permanent or temporary errors).
	RUN	Run	The module' power stage is enabled.
	ERR	Error	A permanent or temporary error exists on the module. Examples of permanent errors: • Low level on an enable input • Internal error on the device (e.g. IGBT heat sink temperature sensor defective) Examples of temporary errors: • 24 VDC supply voltage exceeds the tolerance range • DC bus voltage exceeds the tolerance range • Internal 15 VDC control voltage exceeds the tolerance range • Over-temperature on the module (IGBT junction, heat sink) • Powerlink network disturbance • Over-temperature on the line filter / regeneration choke (temperature sensor)
Supply voltage	24V	24 V OK	The 24V module supply voltage is within the tolerance range
Encoder slot 1	UP	Encoder direction of rotation +	The encoder position of the connected encoder changed in the positive direction. The faster the encoder position changes, the brighter the LED is lit.
	DN	Encoder direction of rotation -	The encoder position of the connected encoder changed in the negative direction. The faster the encoder position changes, the brighter the LED is lit
Encoder slot 2	UP	Encoder direction of rotation +	See encoder slot 1
	DN	Encoder direction of rotation -	

Table 4: LED status - 8BVP power supply module

2.2 8B0C auxiliary supply module

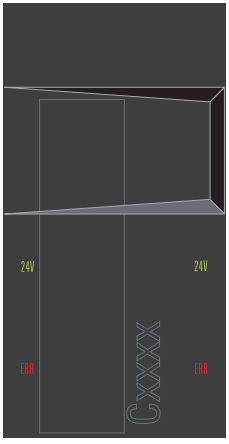
Image	Indicator group	Label	Color	Function
	Supply voltage	24V	Green	24 V OK
		42V[1]		42 V OK [1]
	Overload	ERR	Red	Overload
	24 V Out and 42 V Out [2]	24V	Green	24 V Out OK
		42V[1]		42 V Out OK [1]
		ERR	Red	24 V Out error 42 V Out error [1]

Table 5: Status LEDs, 8B0C auxiliary supply modules

1) Only on 8B0C0160HC00.A01-1.
2) Only on 8B0C0160Hx00.001-1, 8B0C0160HC00.A01-1 and 8B0C0320Hx00.002-1.

2.2.1 LED Status

Indicator group	Label	Function	Description
Supply voltage	24V	24 V OK	The 24 VDC internal system supply voltage is within the permissible tolerance
	42V[1]	42 V OK	The 42 VDC supply is within the permissible tolerance
Overload	ERR	Overload	The 24 VDC internal system supply voltage or 42 VDC supply is outside of the permissible tolerance (overload, over-temperature, short-circuit, etc)
24 V Out and 42 V Out [2]	24V	24 V Out OK	One of the switchable 24 VDC outputs or 42 VDC outputs is active and the output voltage is within the permissible tolerance The 24 VDC internal system supply voltage is within the permissible tolerance [3]
	42V[1]	42 V Out OK	
	ERR	24 V Out error 42 V Out error [1]	The 24 VDC internal system supply voltage or 42 VDC supply is outside of the permissible tolerance (overload, over-temperature, short-circuit, etc) At least one of the switchable outputs is active **and** the electronic fuse has been triggered on one or more switchable outputs.

Table 6: LED status - 8B0C auxiliary supply modules

1) Only on 8B0C0160HC00.A01-1.
2) Only on 8B0C0160Hx00.001-1, 8B0C0160HC00.A01-1 and 8B0C0320Hx00.002-1.
3) Only on 8B0C0160Hx00.001-1 and 8B0C0320Hx00.002-1.

2.3 8BVI inverter modules

2.3.1 Single-axis modules

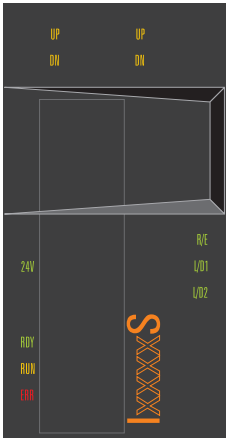
Image	Indicator group	Label	Color	Function
	Ethernet POWERLINK	R/E	Green/red	Ready/Error
		L/D1	Green	Link / Data activity Port 1
		L/D2	Green	Link / Data activity Port 2
	Inverter axis 1	RDY	Green	Ready
		RUN	Orange	Run
		ERR	Red	Error
	Supply voltage	24V	Green	24 V OK
	Encoder slot 1	UP	Orange	Encoder direction of rotation +
		DN	Orange	Encoder direction of rotation -
	Encoder slot 2	UP	Orange	Encoder direction of rotation +
		DN	Orange	Encoder direction of rotation -

Table 7: Status LEDs, 8BVI inverter modules (single-axis modules)

LED Status

Indicator group	Label	Function	Description
Ethernet POWERLINK	R/E	Ready/Error	see LED status ETHERNET Powerlink
	L/D1	Link / Data activity Port 1	
	L/D2	Link / Data activity Port 2	
Inverter axis 1	RDY	Ready	The module is operational and the power stage can be enabled (operating system present and booted, no permanent or temporary errors).
	RUN	Run	The module' power stage is enabled.
	ERR	Error	A permanent or temporary error exists on the module. Examples of permanent errors: • Low level on an enable input • Internal error on the device (e.g. IGBT heat sink temperature sensor defective) • Motor feedback not connected or defective • Motor temperature sensor not connected or defective Examples of temporary errors: • 24 VDC supply voltage exceeds the tolerance range • DC bus voltage exceeds the tolerance range • Internal 15 VDC control voltage exceeds the tolerance range • Over-temperature on the module (IGBT junction, heat sink) • Powerlink network disturbance • IGBT current limit reached • Over-temperature on the motor (temperature sensor)
Supply voltage	24V	24 V OK	The 24V module supply voltage is within the tolerance range
Encoder slot 1	UP	Encoder direction of rotation +	The encoder position of the connected encoder changed in the positive direction. The faster the encoder position changes, the brighter the LED is lit.
	DN	Encoder direction of rotation -	The encoder position of the connected encoder changed in the negative direction. The faster the encoder position changes, the brighter the LED is lit
Encoder slot 2	UP	Encoder direction of rotation +	See encoder slot 1
	DN	Encoder direction of rotation -	

Table 8: LED status, 8BVI inverter modules (single-axis modules)

2.3.2 Two-axis modules

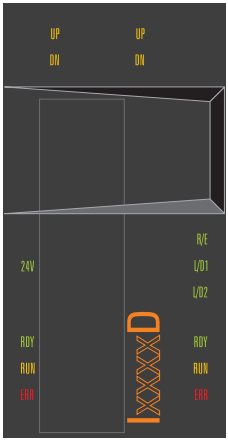
Image	Indicator group	Label	Color	Function
	Ethernet POWERLINK	R/E	Green/red	Ready/Error
		L/D1	Green	Link / Data activity Port 1
		L/D2	Green	Link / Data activity Port 2
	Inverter axis 1	RDY	Green	Ready
		RUN	Orange	Run
		ERR	Red	Error
	Inverter axis 2	RDY	Green	Ready
		RUN	Orange	Run
		ERR	Red	Error
	Supply voltage	24V	Green	24 V supply voltage OK
	Encoder Slot1	UP	Orange	Encoder direction of rotation +
		DN	Orange	Encoder direction of rotation -
	Encoder slot 2	UP	Orange	Encoder direction of rotation +
		DN	Orange	Encoder direction of rotation -

Table 9: Status LEDs, 8BVI inverter modules (two-axis modules)

LED Status

Indicator group	Label	Function	Description
Ethernet POWERLINK	R/E	Ready/Error	see LED status ETHERNET Powerlink
	L/D1	Link / Data activity Port 1	
	L/D2	Link / Data activity Port 2	
Inverter axis 1	RDY	Ready	The module is operational and the power stage can be enabled (operating system present and booted, no permanent or temporary errors).
	RUN	Run	The module' power stage is enabled.
	ERR	Error	A permanent or temporary error exists on the module. Examples of permanent errors: • Low level on an enable input • Internal error on the device (e.g. IGBT heat sink temperature sensor defective) • Motor feedback not connected or defective • Motor temperature sensor not connected or defective Examples of temporary errors: • 24 VDC supply voltage exceeds the tolerance range • DC bus voltage exceeds the tolerance range • Internal 15 VDC control voltage exceeds the tolerance range • Over-temperature on the module (IGBT junction, heat sink) • Powerlink network disturbance • IGBT current limit reached • Over-temperature on the motor (temperature sensor)
Inverter axis 2	RDY	Ready	See inverter axis 1
	RUN	Run	
	ERR	Error	
Supply voltage	24V	24 V OK	The 24V module supply voltage is within the tolerance range
Encoder slot 1	UP	Encoder direction of rotation +	The encoder position of the connected encoder changed in the positive direction. The faster the encoder position changes, the brighter the LED is lit.
	DN	Encoder direction of rotation -	The encoder position of the connected encoder changed in the negative direction. The faster the encoder position changes, the brighter the LED is lit
Encoder slot 2	UP	Encoder direction of rotation +	See encoder slot 1
	DN	Encoder direction of rotation -	

Table 10: LED status, 8BVI inverter modules (two-axis modules)

2.4 LED Status

2.4.1 Ethernet POWERLINK

Indicator group	Label	Function	Description
Ethernet POWERLINK	R/E	Ready/Error	Red: The Powerlink node number of the module is 0
	L/D1	Link / Data activity Port 1	
	L/D2	Link / Data activity Port 2	

Table 11: See LED status ETHERNET Powerlink

2.4.2 Status changes when booting the operating system loader

The following timing is used for the indication diagrams:

Block size: 125 ms

Repeats after: 3000 ms

Status	LED	Display
1. Boot procedure for basic hardware active	RDY	
	RUN	
	ERR	
2. Configuration network active	RDY	
	RUN	
	ERR	
3. Waiting for network telegram	RDY	
	RUN	
	ERR	
4. Network communication active	RDY	
	RUN	
	ERR	

Table 12: Status changes when booting the operating system loader

3. Line filter 8BVF

3.1 Order data

Model number	Short description	Image
	Line filters	8BVF0440H000.001-2
8BVF0110H000.000-1	ACOPOSmulti line filter 15A, 480V	
8BVF0440H000.001-2	ACOPOSmulti line filter 44A, 480V, increased peak current load capacity	
8BVF0880H000.000-1	ACOPOSmulti line filter 89A, 480V	

Table 13: Order data - 8BVF line filter

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
In preparation[1)]	1	Screw terminal 4 pins, 1 row RM7,62 Label 2: L1 L2 L3 PE Coding N: 1100	Plug for X1 connection	171
8TB4104.202N-10 [2)]	1	Screw terminal 4 pins, 1 row RM10,16 Label 2: L1 L2 L3 PE Coding N: 1100	Plug for X1 connection	171
In preparation[1)]	1	Screw terminal 4 pins, 1 row RM7,62 Label 2: L1´ L2´ L3´ PE Coding D: 0011	Plug for X2 connection	171
8TB4104.206D-10 [2)]	1	Screw terminal 4 pins, 1 row RM10,16 Label 2: L1´ L2´ L3´ PE Coding D: 0011	Plug for X2 connection	171
8TB2104.204A-00	1	Screw terminal 4 pins, 1 row RM5,08 Label 4: T- T+ F- F+ Coding A: 0000	Plug for X3 connection	171

Table 14: Required accessory for 8BVF line filters

1) Only for 8BVF0110H000.001-1.
2) Only for 8BVF0440H000.001-1.

3.2 Technical data

Product ID	8BVF0110H000.000-1	8BVF0440H000.001-2	8BVF0880H000.000-1
General information			
C-UL-US listed	In preparation		
Cooling and mounting methods	Wall mounting		
Power mains connection			
Mains input voltage	3x220 to 3x480VAC ±10 %		
Frequency	50 / 60 Hz ± 4%		
Allocation to the power supply module	10 kW	32 kW	60 kW
Continuous current [1]	15 A_{eff}	44 A_{eff}	89 A_{eff}
Peak current < 10 s	In preparation	110 A_{eff}	162 A_{eff}
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation	In preparation	In preparation
Power loss at rated current	In preparation	250 W	470 W
Line filter according to EN61800-3-A11 second environment (Limits from CISPR11, Group 2, Class A) [2]	Yes		
Design L1, L2, L3, PE and L1´, L2´, L3´, PE PU Shield connection on the mains on the device	Connectors Threaded bolt M5 No Yes [3]		Feed-through terminals No No Yes [3]
Terminal connection cross section Flexible and fine wire lines with wire tip sleeves UL/cUlus CSA	0.5 - 6 mm² 22 - 10 22 - 10	0.5 - 16 mm² 20 - 6 20 - 6	10 - 50 mm² 6-1/0 6-1/0
Terminal outer cross-section dimension of the shield connection	12 - 22 mm	23 - 35 mm	32 - 50 mm
Temperature sensor			
Temperature sensor type	EPCOS B59100M1155A070		
Design T+, T-	Connectors		
Fan connection			
Design F+, F-	Connectors		

Table 15: Technical data - 8BVF line filters

Product ID	8BVF0110H000.000-1	8BVF0440H000.001-2	8BVF0880H000.000-1
Mechanical characteristics			
Dimensions			
Width	In preparation	135 mm	175 mm
Height	In preparation	378 mm	436 mm
Depth	In preparation	212 mm	212 mm
Weight	In preparation	15 kg	23.5 kg

Table 15: Technical data - 8BVF line filters (cont.)

1) Valid in the following conditions: 40 °C ambient temperature, installation altitude< 500 m above sea level.
2) To avoid exceeding the EMC limit values, the total length of all motor cables for each mounting plate (and therefore each line filter) should be limited to a maximum of 900 m. The cable length between the line filter and the power supply module is limited to a maximum of 5 m.
   The maximum motor cable length per motor connection is also limited (see inverter modules).
3) The cable does not require shielding up to a total cable length between the line filter, regeneration choke and power supply module of 3 m. Please contact B&R when using cable lengths > 3 m.

4. 8BVR regeneration chokes

4.1 Order data

Model number	Short description	Image
	Regeneration choke	
8BVR0110H000.100-1	ACOPOSmulti regeneration choke 15A, 480V, terminals	
8BVR0440H000.100-1	ACOPOSmulti regeneration choke 44A, 480V, terminals	
8BVR0880H000.100-1	ACOPOSmulti regeneration choke 89A, 480V, terminals	
		8BVR0440H000.100-1

Table 16: Order data - 8BVR regeneration chokes

4.2 Technical data

Product ID	8BVR0110H000.100-1	8BVR0440H000.100-1	8BVR0880H000.100-1
General information			
C-UL-US listed	In preparation		
Cooling and mounting methods	Wall mounting		
Power mains connection			
Mains input voltage	3x220 to 3x480VAC ±10 %		
Frequency	50 / 60 Hz ± 4%		
Allocation to the power supply module	10 kW	32 kW	60 kW
Continuous current [1]	15 A_{eff}	44 A_{eff}	89 A_{eff}
Peak current < 10 s	In preparation	110 A_{eff}	162 A_{eff}
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation	In preparation	In preparation
Power loss at rated current	In preparation	330 W	470 W
Design U1, V1, W1 U2, V2, W2 Shield connection [2] on the mains on the device	 Terminals Terminals No No		

Table 17: Technical data - 8BVR regeneration chokes

Product ID	8BVR0110H000.100-1	8BVR0440H000.100-1	8BVR0880H000.100-1
Terminal connection cross section Flexible and fine wire lines with wire tip sleeves UL/cUlus CSA		1.5 - 16 mm² 18 - 4 18 - 4	2.5 - 35 mm² 12 - 1 12 - 2
Terminal outer cross-section dimension of the shield connection	---		
Temperature sensor			
Temperature sensor type	EPCOS B59100M1155A070		
Design T+, T-	Terminals		
Mechanical characteristics			
Dimensions Width Height Depth	 In preparation In preparation In preparation	 240 mm 280 mm 125 mm	 290 mm 406 mm 135 mm
Weight	In preparation	24.1 kg	40.2 kg

Table 17: Technical data - 8BVR regeneration chokes (cont.)

1) Valid in the following conditions: 40 °C ambient temperature, installation altitude< 500 m above sea level.
2) The cable does not require shielding up to a total cable length between the line filter, regeneration choke and power supply module of 3 m. Please contact B&R when using cable lengths > 3 m.

5. 8B0M mounting plates

5.1 Order data

Model number[1]	Short description	Image
	Wall mounting	
8B0MnnnnHW00.000-1 [2]	ACOPOSmulti mounting plate with backplane nnnn slots, 800V, wall mounting, 75mm² and 22mm², complete	
	Cold plate mounting	
8B0MnnnnHC00.000-1	ACOPOSmulti mounting plate with backplane, nnnn slots, 800V, cold plate mounting, 75mm² and 22mm², complete	
	Feed-through mounting	
8B0MnnnnHF00.000-1 [3]	ACOPOSmulti mounting plate with backplane nnnn slots, 800V, feed-through mounting, 75mm² and 22mm², complete	

8B0MnnnnHW00.000-1

8B0MnnnnHC00.000-1

8B0MnnnnHF00.000-1

Table 18: Order data - 8B0M mounting plates

1) The desired number of slots must be specified in the model number by nnnn (0160 equals 16 slots).
2) Only mounting plates with 2 or more slots are possible.
3) The number of slots must be a multiple of 4.

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8B0M0040HFF0.000-1 [1]	---	ACOPOSmulti fan module for mounting plate, 4 slots, 800V, feed-through mounting	One fan module is required for every 4 slots	
X67CA0P20.xxxx [1] [2]	1	Power connection cable, xxxx m	24 VDC connection cable for ACOPOSmulti fan modules 8B0M0040HFF0.000-1	
X67CA0P00.0002 [1]	max. 2	Power connection cable, 0.2 m	24 VDC connection cable between two ACOPOSmulti fan modules 8B0M0040HFF0.000-1	

Table 19: Optional accessory for 8B0M mounting plates

1) Only for 8B0MnnnnHF00.000-1.

2) The cable length is specified in decimeters by xxxx (0010 equals a cable length of 1 m).

5.2 Technical data

Product ID [1]	**8B0MnnnnHW00.000-1**	**8B0MnnnnHC00.000-1**	**8B0MnnnnHF00.000-1**
General information			
C-UL-US listed	In preparation		
Cooling and mounting methods	Wall mounting	Cold plate mounting	Feed-through mounting
Number of slots Max.	nnnn [2] 27	nnnn 27	nnnn [3] 27
DC bus			
Voltage Max.	800 VDC 900 VDC		
Continuous power [4]	200 kW		
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation	In preparation	In preparation
Reduction of continuous power depending on altitude Starting at 500 m above sea level	20 kW per 1,000 m		
Cross section DC+, DC- PU	72 mm² 72 mm²		
24 VDC auxiliary supply			
Voltage	25 VDC ± 1.6 %		
Continuous power [4]	1500 W		
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation	In preparation	In preparation
Reduction of continuous power depending on altitude Starting at 500 m above sea level	150 W per 1000 m		
Cross section 24 VDC, COM	21.3 mm²		

Table 20: Technical data - 8B0M mounting plates

Product ID [1]	8B0MnnnnHW00.000-1	8B0MnnnnHC00.000-1	8B0MnnnnHF00.000-1
Operational conditions			
Ambient temperature during operation Max. ambient temperature [5]	0 to 40 °C +55 °C		
Relative humidity during operation	5 to 95 %, non-condensing		
Installation at altitudes above sea level Maximum installation altitude [6]	0 to 500 m 4,000 m		
Degree of pollution according to EN 60664-1	2 (non-conductive material)		
Overvoltage category according to IEC 60364-4-443:1999	III		
EN 60529 protection	IP20		IP64 Fan module IP54 (8B0M0040HFF0.000-1)
Storage and transport conditions			
Storage temperature	-25 to +55 °C		
Relative humidity during storage	5 to 95 %, non-condensing		
Transport temperature	-25 to +70 °C		
Relative humidity during transport	95 % at +40 °C		
Mechanical characteristics			
Dimensions [7] Width Height Depth	 (n * 53.5) mm 385 mm 13.5 mm	 (37 + n * 53.5) mm 378 mm 17 mm	 (64 + n * 53.5) mm 378 mm 14 mm
Weight	In preparation	(0.94 * number of slots) kg	(1.6 * number of slots) kg

Table 20: Technical data - 8B0M mounting plates (cont.)

1) The desired number of slots must be specified in the model number by nnnn (0160 equals 16 slots).
2) Only mounting plates with 2 or more slots are possible.
3) The number of slots must be a multiple of 4.
4) Valid in the following conditions: 40 °C ambient temperature, installation altitude< 500 m above sea level.
5) Continuous operation of ACOPOSmulti mounting plates at an ambient temperature ranging from 40 °C to max. 55 °C is possible (taking the continuous power reductions listed into consideration).
6) Continuous operation of ACOPOSmulti mounting plates at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous power reductions listed into consideration). Additional requirements are to be arranged with B&R.
7) The dimensions define the actual size of the mounting plate. Make sure to leave additional space above and below the mounting plate for mounting, connections and air circulation (see 2 "Dimension diagrams and installation dimensions" on page 96).

6. 8BVP power supply modules

6.1 Order data

Model number	Short description	Image
	Wall mounting	8BVP0110HC00.000-1 8BVP0880HC00.000-1
8BVP0110HW00.000-1	ACOPOSmulti power supply module 11A, 800V, wall mounting	
8BVP0440HW00.000-1	ACOPOSmulti power supply module 44A, 800V, wall mounting	
8BVP0880HW00.000-1	ACOPOSmulti power supply module 88A, 800V, wall mounting	
	Cold plate or feed-through mounting	
8BVP0110HC00.000-1	ACOPOSmulti power supply module 11A, 800V, cold plate or feed-through mounting	
8BVP0440HC00.000-1	ACOPOSmulti power supply module 11A, 800V, cold plate or feed-through mounting	
8BVP0880HC00.000-1	ACOPOSmulti power supply module 88A, 800V, cold plate or feed-through mounting	

Table 21: Order data - 8BVP power supply modules, 10kW ... 60kW

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8TB2106.2010-00	1	Screw terminal 6 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X1 connection	178
8TB2108.2010-00	1	Screw terminal 8 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X2 connection	178
8TB2104.204A-00	1	Screw terminal 4 pins, 1 row RM5,08 Label 4: T- T+ F- F+ Coding A: 0000	Plug for X4A connection	178

Table 22: Required accessories - 8BVP power supply modules (10kW ... 60kW)

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
In preparation[1)]	1	Screw terminal 4 pins, 1 row RM10,16 Label 2: L1 L2 L3 PE Coding N: 1100	Plug for X5A connection	178
In preparation[2)]	1	Screw terminal 4 pins, 1 row RM10,16 Label 2: L1 L2 L3 PE Coding N: 1100	Plug for X5A connection	178

Table 22: Required accessories - 8BVP power supply modules (10kW ... 60kW) (cont.)

1) Only for 8BVP0110Hx00.000-1.
2) Only for 8BVP0440Hx00.000-1.

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8BAC0120.000-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.1 interface	---	78
8BAC0120.001-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.2 interface	---	85
8BAC0122.000-1	max. 2	ACOPOSmulti plug-in module, Resolver interface	---	87
8BAC0124.000-1	max. 2	ACOPOSmulti plug-in module, SinCos interface	---	91
8SCS005.0000-00	Up to 2	Shield component set consisting of: 1 slot cover shield sheet	Shield sheet for covering free plug-in module slots	---
8SCS002.0000-00	1	Shield component set consisting of: 1 clamping plate 2 clamps D 4-13.5mm 2 screws	Shield component set for I/O cable with a cable diameter of 4 - 13.5 mm	---
8SCS000.0000-00 [1)]	1	Shield component set consisting of: 1 shield plate 1x type 0 1 hose clamp, W 9mm, D 12-22mm	Shield component set for power cables with a diameter of 12 - 22 mm	---
In preparation[2)]	1	Shield component set consisting of: 1 shield plate 1x type 0 1 hose clamp, W 9mm, D 23-35mm	Shield component set for power cables with a diameter of 23 - 35 mm	---
8SCS003.0000-00 [3)]	1	Shield component set consisting of: 1 shield mounting plate, 4x, 45° 8 screws	Base plate for mounting shield component set 8SCS001.0000-00 or 8SCS004.0000-00	---
8SCS004.0000-00 [3)]	1	Shield component set consisting of: 1 shield plate, 4x, type 0 2 hose clamps, W 9mm, D 32-50mm	Shield component set for power cables with a diameter of 32 - 50 mm	---
8SCS001.0000-00 [3)]	3	Shield component set consisting of: 1 shield plate, 4x, type 1 1 hose clamp, W 9mm, D 12-22mm	Shield component set for individual wires with a diameter of 12 - 22 mm	---

Table 23: Optional accessories - 8BVP power supply modules (10kW ... 60kW)

1) Only for 8BVP0110Hx00.000-1.
2) Only for 8BVP0440Hx00.000-1.
3) Only for 8BVP0880Hx00.000-1.

6.2 Technical data

Product ID Wall mounting Cold plate or feed-through mounting	8BVP0110HW00.000-1 8BVP0110HC00.000-1	8BVP0440HW00.000-1 8BVP0440HC00.000-1	8BVP0880HW00.000-1 8BVP0880HC00.000-1
General information			
C-UL-US listed	In preparation		
Available cooling and mounting methods Wall mounting Cold plate or feed-through mounting	 Yes Yes	 Yes Yes	 Yes Yes
Module width	1	2	4
Power mains connection			
Mains input voltage [1]	3x220 to 3x480VAC ±10 %		
System configuration	TT, TN-S, TN-C-S		
Frequency	50 / 60 Hz ± 4%		
Installed load	In preparation		
Power loss at max. device power	In preparation		
Starting current at 400 VAC	In preparation		
Switch-on interval	> 10 s		
Max. chargeable DC bus voltage	2 mF	4 mF	8 mF
Rated switching frequency	5 kHz		
Integrated line filter according to EN 61800-3-A11 second environment (limits from CISPR11, group 2, class A)	No		
Integrated regeneration choke	No		
Capable of regeneration	Yes		
Power Factor Control (PFC)	Yes		
Design L1, L2, L3, PE PU Shield connection	 Connectors Threaded bolt M5 Yes [2]	 Connectors Threaded bolt M5 Yes [2]	 Threaded bolt M8 No Yes [2]
Terminal connection cross sections Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 0.5 - 6 mm² 22 - 10 22 - 10	 0.5 - 16 mm² 20 - 6 20 - 6	 6 - 50 mm² [3] In preparation In preparation
Terminal cable outer-cross-section dimension of the shield connection	12 - 22 mm	23 - 35 mm	32 - 50 mm

Table 24: Technical data - 8BVP power supply modules (10kW ... 60kW)

Product ID Wall mounting Cold plate or feed-through mounting	8BVP0110HW00.000-1 8BVP0110HC00.000-1	8BVP0440HW00.000-1 8BVP0440HC00.000-1	8BVP0880HW00.000-1 8BVP0880HC00.000-1
DC bus connection			
Voltage Max.	800 VDC 900 VDC		
Continuous power (supply and regeneration) [4]	10 kW	25 kW	60 kW
Reduction of continuous power according to the ambient temperature above 40 °C	In preparation	In preparation	In preparation
Reduction of continuous power depending on altitude starting at 500 m above sea level	1 kW per 1,000 m	2.5 kW per 1,000 m	6 kW per 1,000 m
Reduction of continuous power depending on cooling method Wall mounting Cold plate or feed-through mounting	In preparation In preparation	In preparation In preparation	In preparation In preparation
Peak power (supply and regeneration)	25 kW	50 kW	121 kW
Power loss at max. device power	In preparation	In preparation	In preparation
DC bus capacitance	In preparation		1650 µF
Protective measures Overload protection Short circuit and ground fault	Yes No		
Design	ACOPOSmulti backplane		
24 VDC supply [5]			
Input voltage	25 VDC ± 1.6 %		
Input capacitance	In preparation		4.7 µF
Power consumption	In preparation		
Design	ACOPOSmulti backplane		
Line filter fan connection			
Output voltage	24V +5.8 / -0.1 %		
Continuous current	2.1 A		4.2 A
Protective measures Overload and short circuit protection Cable breakage monitoring Undervoltage monitoring	Yes No No		
Max. over-current limitation	8 A		

Table 24: Technical data - 8BVP power supply modules (10kW ... 60kW) (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8BVP0110HW00.000-1 8BVP0110HC00.000-1	8BVP0440HW00.000-1 8BVP0440HC00.000-1	8BVP0880HW00.000-1 8BVP0880HC00.000-1
Trigger inputs			
Number of inputs	2		
Wiring	Sink		
Electrical isolation Input - Power supply module Input - Input	 Yes Yes		
Input voltage Rated Maximum	 24 VDC 30 VDC		
Switching threshold LOW HIGH	 <5 V >15 V		
Input current at rated voltage	approx. 10 mA		
Switching delay Positive edge Negative edge	 52 µs ± 0.5 µs (digitally filtered) 53 µs ± 0.5 µs (digitally filtered)		
Modulation compared to ground potential	Max. ±38 V		
24 V Out			
Amount	2		
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	 25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %		
Fuse protection	500 mA (slow-blow) electronic, automatic reset		
Operational conditions			
Ambient temperature during operation Max. ambient temperature [6]	0 to 40 °C +55 °C		
Relative humidity during operation	5 to 95 %, non-condensing		
Installation at altitudes above sea level Maximum installation altitude [7]	0 to 500 m 4,000 m		
Degree of pollution according to EN 60664-1	2 (non-conductive material)		
Overvoltage category according to IEC 60364-4-443:1999	III		
EN 60529 protection	IP20		
Storage and transport conditions			
Storage temperature	-25 to +55 °C		
Relative humidity during storage	5 to 95 %, non-condensing		
Transport temperature	-25 to +70 °C		
Relative humidity during transport	95 % at +40 °C		

Table 24: Technical data - 8BVP power supply modules (10kW ... 60kW) (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8BVP0110HW00.000-1 8BVP0110HC00.000-1	8BVP0440HW00.000-1 8BVP0440HC00.000-1	8BVP0880HW00.000-1 8BVP0880HC00.000-1
Mechanical characteristics			
Dimensions [8]			
Width	53 mm	106.5 mm	213.5 mm
Height	317 mm	317 mm	317 mm
Depth			
Wall mounting	263 mm	263 mm	263 mm
Cold-plate	212 mm	212 mm	212 mm
Feed-through mounting	209 mm	209 mm	209 mm
Weight			
Wall mounting	In preparation		In preparation
Cold-plate	In preparation		approx. 7.6 kg
Feed-through mounting	In preparation		approx. 7.6 kg

Table 24: Technical data - 8BVP power supply modules (10kW ... 60kW) (cont.)

1) When operating with 3 x 220 VAC to 3 x 400 VAC, the continuous power is derated (250 W per volt).
2) The cable does not require shielding up to a total cable length between the line filter, regeneration choke and power supply module of 3 m. Please contact B&R when using cable lengths > 3 m.
3) The connection is made with cable lugs using an M8 threaded bolt.
4) Valid in the following conditions: 40 °C ambient temperature, installation altitude< 500 m above sea level.
5) In the power supply modules a DC bus power supply is integrated for the electronic supply. The 24 VDC supply from the ACOPOSmulti backplane only feeds the +24 VDC of the trigger inputs and the encoder power supplies on the encoder modules.
6) Continuous operation of ACOPOSmulti power supply modules at ambient temperatures ranging from 40 °C to max. 55 °C is possible (taking the continuous current reductions listed into consideration), but results in a shorter lifespan.
7) Continuous operation of ACOPOSmulti power supply modules at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous current reductions listed into consideration). Additional requirements are to be arranged with B&R.
8) The dimensions define the true device dimensions including the respective mounting plate. Make sure to leave additional space above and below the device for mounting, connections and air circulation (see section 2 "Dimension diagrams and installation dimensions" on page 96).

7. 8B0C control supply unit - 400W

Warning!

The auxiliary supply modules are components of and may only be used in connection with the ACOPOSmulti drive system.

Information:

Up to five auxiliary supply modules with any power rating can be set up in parallel.

7.1 Order data

Model number	Short description	Image
	Wall mounting	8B0C0160HC00.001-1
8B0C0160HW00.000-1	ACOPOSmulti auxiliary supply module 16A, 800V, Wall mounting	
8B0C0160HW00.001-1	ACOPOSmulti auxiliary supply module 16A, 800V, Wall mounting, 24VOut 1x16A, 1x5A	
	Cold plate or feed-through mounting	
8B0C0160HC00.000-1	ACOPOSmulti auxiliary supply module 16A, 800V, Cold plate or feed-through mounting	
8B0C0160HC00.001-1	ACOPOSmulti auxiliary supply module 16A, 800V, Cold plate or feed-through mounting, 24VOut 1x16A, 1x5A	

Table 25: Order data for 8B0C control supply units 400W

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8TB2106.2010-00	1	Screw terminal 6 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X1 connection	183
8TB2104.2010-00 [1)]	1	Screw terminal 4 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X2 connection	185
8TB3104.201M-10 [1)]	1	Screw terminal 4 pins, 1 row RM7,62 Label 1: numbered serially Coding M: 1011	Plug for X3 connection	185

Table 26: Required accessories for 8B0C auxiliary supply modules 400W

1) Only for 8B0C0160Hx00.001-1.

7.2 Technical data

Product ID **Wall mounting** **Cold plate or feed-through mounting**	**8B0C0160HW00.000-1** **8B0C0160HC00.000-1**	**8B0C0160HW00.001-1** **8B0C0160HC00.001-1**
General information		
C-UL-US listed	In preparation	
Available cooling and mounting methods Wall mounting Cold plate or feed-through mounting	 Yes Yes	
Module width	1	
DC bus connection		
Voltage Operating range in continuous operation Full continuous power	800 VDC 260 - 900 VDC 315 - 900 VDC	
Continuous power consumption	Max. 470 W	
Power loss at max. device power	In preparation	
DC bus capacitance	In preparation	
Design	ACOPOSmulti backplane	
24 VDC output		
Continuous power [1)]	400 W	
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	 25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %	
Continuous current	16 ADC	
Reduction of continuous power according to ambient temperature above 40 °C	No reduction	
Reduction of continuous power depending on altitude Starting at 500 m above sea level	 40 W per 1000 m	
Reduction of continuous power depending on cooling method Wall mounting Cold plate or feed-through mounting	 In preparation In preparation	
Startup delay	Max. 1 sec.	
Startup time	Approx. 5 - 20 ms	
Residual ripple	Typ. 50 mV_{SS}	

Table 27: Technical data for 8B0C control supply units 400W

Product ID Wall mounting Cold plate or feed-through mounting	8B0C0160HW00.000-1 8B0C0160HC00.000-1	8B0C0160HW00.001-1 8B0C0160HC00.001-1
24 VDC internal system supply voltage		
Output voltage	25 VDC ± 1.6 %	
Peak current (< 4 s) DC bus voltage (UDC): 350 ... 900 VDC	21 ADC	
Protective measures Open circuit protection Overload protection Short circuit protection Feedback protection Over-temperature protection Dielectric strength to ground Output / input isolation	 Yes Yes Yes Max. 26 VDC (also when turned off) Yes ±50 VDC SELV / PELV requirements	
Design	ACOPOSmulti backplane	
24 VDC Out		
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	 --- ---	 25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %
Peak current (< 4 s) over the total operating range of the DC bus voltage.	---	---
Protection of 24 VDC Out 1 output	---	16 A (slow-blow) electronic, automatic reset
Protection of 24 VDC Out 2 output	---	5 A (slow-blow) electronic, automatic reset
Protective measures Open circuit protection Overload protection Short circuit protection Feedback protection Over-temperature protection Dielectric strength to ground Output / input isolation	 --- --- --- --- --- --- ---	 Yes Yes Yes Max. 35 VDC (also when turned off) Yes ±50 VDC SELV / PELV requirements
Design 24 VDC, COM	 ---	 Connectors
Terminal connection cross section of 24 VDC Out 1 output Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 --- --- ---	 0.5 - 6 mm² 22 - 10 22 - 10
Terminal connection cross section of 24 VDC Out 2 output Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 --- --- ---	 0.2 - 2.5 mm² 22 - 12 22 - 12

Table 27: Technical data for 8B0C control supply units 400W (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8B0C0160HW00.000-1 8B0C0160HC00.000-1	8B0C0160HW00.001-1 8B0C0160HC00.001-1
24 VDC Out 1 controller input		
Wiring	---	Sink
Electrical isolation Input - 24 VDC	 ---	 Yes
Modulation compared to ground potential	---	Max. ±50 V
Input voltage Rated Maximum	 --- ---	 24 VDC 30 VDC
Switching threshold LOW (24 VDC Out 1 is switched on) HIGH (24 VDC Out 1 is switched off)	 --- ---	 <5 V >15 V
Input current at rated voltage	---	approx. 10 mA
Switching delay ON (24 VDC Out 1 is switched on) OFF (24 VDC Out 1 is switched off) [2]	 --- ---	 Max. 25 ms Max. 0.25 ms
Design	---	Connectors
Terminal connection cross section of the 24 VDC Out 1 control input Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 --- --- ---	 0.2 - 2.5 mm² 30 - 12 22 - 12
Operational conditions		
Ambient temperature during operation Max. ambient temperature	0 to 40 °C +55 °C	
Relative humidity during operation	5 to 95 %, non-condensing	
Installation at altitudes above sea level Maximum installation altitude [3]	0 to 500 m 4,000 m	
Degree of pollution according to EN 60664-1	2 (non-conductive material)	
Overvoltage category according to IEC 60364-4-443:1999	III	
EN 60529 protection	IP20	
Storage and transport conditions		
Storage temperature	-25 to +55 °C	
Relative humidity during storage	5 to 95 %, non-condensing	
Transport temperature	-25 to +70 °C	
Relative humidity during transport	95 % at +40 °C	

Table 27: Technical data for 8B0C control supply units 400W (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8B0C0160HW00.000-1 8B0C0160HC00.000-1	8B0C0160HW00.001-1 8B0C0160HC00.001-1
Mechanical characteristics		
Dimensions [4] Width Height Depth Wall mounting Cold-plate Feed-through mounting	 53 mm 317 mm 263 mm 212 mm 209 mm	
Weight Wall mounting Cold-plate Feed-through mounting	 In preparation approx. 2.6 kg approx. 2.6 kg	

Table 27: Technical data for 8B0C control supply units 400W (cont.)

1) Valid in the following conditions: 55 °C ambient temperature, installation altitude< 500 m above sea level.
2) The output and any connected loads are not actively discharged when switching off.
3) Continuous operation of ACOPOSmulti control supply units at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous power reductions listed into consideration). Additional requirements are to be arranged with B&R.
4) The dimensions define the true device dimensions including the respective mounting plate. Make sure to leave additional space above and below the device for mounting, connections and air circulation (see section 2 "Dimension diagrams and installation dimensions" on page 96).

8. 8B0C control supply units - 800W

Warning!

The auxiliary supply modules are components of and may only be used in connection with the ACOPOSmulti drive system.

Information:

Up to five auxiliary supply modules with any power rating can be set up in parallel.

8.1 Order data

Model number	Short description	Image
	Wall mounting	8B0C0320HC00.002-1
8B0C0320HW00.000-1	ACOPOSmulti auxiliary supply module 32A, 800V, Wall mounting	
8B0C0320HW00.002-1	ACOPOSmulti auxiliary supply module 32A, 800V, Wall mounting, 24VOut 1x32A, 1x5A	
	Cold plate or feed-through mounting	
8B0C0320HC00.000-1	ACOPOSmulti auxiliary supply module 32A, 800V, Cold plate or feed-through mounting	
8B0C0320HC00.002-1	ACOPOSmulti auxiliary supply module 32A, 800V, Cold plate or feed-through mounting, 24VOut 1x32A, 1x5A	
8B0C0160HC00.A01-1	ACOPOSmulti auxiliary supply module 16A, 800V, Cold plate or feed-through mounting, 42VOut 1x16A, 1x3A	

Table 28: Order data for 8B0C control supply units 800W

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8TB2106.2010-00	1	Screw terminal 6 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X1 connection	183
8TB2104.2010-00 [1)]	1	Screw terminal 4 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X2 connection	185
8TB3104.201M-10 [2)]	1	Screw terminal 4 pins, 1 row RM7,62 Label 1: numbered serially Coding M: 1011	Plug for X3 connection	185
8TB3104.201H-10 [3)]	1	Screw terminal 4 pins, 1 row RM7,62 Label 1: numbered serially Coding H: 0111	Plug for X3 connection	185

Table 29: Required accessories for 8B0C control supply units 800W

1) Only for 8B0C0320Hx00.002-1 und 8B0C0160HC00.A01-1.
2) Only for 8B0C0320Hx00.002-1.
3) Only for 8B0C0160HC00.A01-1.

8.2 Technical data

Product ID **Wall mounting** **Cold plate or feed-through mounting**	**8B0C0320HW00.000-1** **8B0C0320HC00.000-1**	**8B0C0320HW00.002-1** **8B0C0320HC00.002-1**	**---** **8B0C0160HC00.A01-1**
General information			
C-UL-US listed	In preparation		
Available cooling and mounting methods Wall mounting Cold plate or feed-through mounting	Yes Yes		No Yes
Module width	1		
DC bus connection			
Voltage Operating range in continuous operation Full continuous power	800 VDC 260 - 900 VDC 315 - 900 VDC		
Continuous power consumption	Max. 940 W		
Power loss at max. device power	80 W		
DC bus capacitance	220 nF		
Design	ACOPOSmulti backplane		
24 VDC or 42 VDC output			
Continuous power [1)]	800 W		
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %		0 V 42 VDC
Continuous current	32 ADC		16 ADC
Reduction of continuous power according to ambient temperature above 40 °C	No reduction		
Reduction of continuous power depending on altitude Starting at 500 m above sea level	80 W per 1000 m		
Reduction of continuous power depending on cooling method Wall mounting Cold plate or feed-through mounting	In preparation In preparation	In preparation In preparation	--- In preparation
Startup delay	Max. 1 sec.		
Startup time	Approx. 5 - 20 ms		
Residual ripple	Typ. 50 mV_{SS}		

Table 30: Technical data for 8B0C control supply units 800W

Product ID **Wall mounting** **Cold plate or feed-through mounting**	**8B0C0320HW00.000-1** **8B0C0320HC00.000-1**	**8B0C0320HW00.002-1** **8B0C0320HC00.002-1**	**---** **8B0C0160HC00.A01-1**
24 VDC internal system supply voltage			
Output voltage	25 VDC ± 1.6 %		---
Peak current (< 4 s) DC bus voltage (UDC): 350 ... 900 VDC	42 ADC		---
Protective measures Open circuit protection Overload protection Short circuit protection Feedback protection Over-temperature protection Dielectric strength to ground Output / input isolation	Yes Yes Yes Max. 26 VDC (also when turned off) Yes ±50 VDC SELV / PELV requirements		--- --- --- --- --- --- ---
Design	ACOPOSmulti backplane		
24 VDC or 42 VDC Out			
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	--- ---	25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %	0 V 42 VDC ± 6 %
Peak current (< 4 s) over the total operating range of the DC bus voltage.	---	---	21 ADC
Protection of 24 VDC Out 1 output	---	32 A (slow-blow) electronic, automatic reset	---
Protection of 24 VDC Out 2 output	---	5 A (slow-blow) electronic, automatic reset	---
Protection of 42 VDC Out 1 output	---	---	16 A (slow-blow) electronic, automatic reset
Protection of 42 VDC Out 2 output	---	---	3 A (slow-blow) electronic, automatic reset
Protective measures Open circuit protection Overload protection Short circuit protection Feedback protection Over-temperature protection Dielectric strength to ground Output / input isolation	 --- --- --- --- --- --- ---	 Yes Yes Yes Max. 35 VDC (also when turned off) Yes ±50 VDC SELV / PELV requirements	 Yes Yes Yes Max. 60 VDC (also when turned off) Yes ±96 VDC SELV / PELV requirements
Design 24 VDC or 42 VDC, COM	 ---	 Connectors	
Terminal connection cross section of 24 VDC or 42 VDC Out 1 output Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 --- --- ---	 0.5 - 6 mm² 22 - 10 22 - 10	

Table 30: Technical data for 8B0C control supply units 800W (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8B0C0320HW00.000-1 8B0C0320HC00.000-1	8B0C0320HW00.002-1 8B0C0320HC00.002-1	--- 8B0C0160HC00.A01-1
Terminal connection cross section of 24 VDC or 42 VDC Out 2 output Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 --- --- ---	 0.2 - 2.5 mm² 22 - 12 22 - 12	
24 VDC or 42 VDC Out 1 control input			
Wiring	---	Sink	
Electrical isolation Input - 24 VDC or 42 VDC	 ---	 Yes	
Modulation compared to ground potential	---	Max. ±50 V	
Input voltage Rated Maximum	 --- ---	 24 VDC 30 VDC	
Switching threshold LOW (24 VDC or 42 VDC Out 1 is switched on) HIGH (24 VDC or 42 VDC Out 1 is switched off)	 --- ---	 <5 V >15 V	
Input current at rated voltage	---	approx. 10 mA	
Switching delay ON (24 VDC or 42 VDC Out 1 is switched on) OFF (24 VDC or 42 VDC Out 1 is switched off) [2]	 --- ---	 Max. 25 ms Max. 0.25 ms	
Design	---	Connectors	
Terminal connection cross section of 24 VDC or 42 VDC Out 1 control input Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 --- --- ---	 0.2 - 2.5 mm² 30 - 12 22 - 12	
Operational conditions			
Ambient temperature during operation Max. ambient temperature	0 to 40 °C +55 °C		
Relative humidity during operation	5 to 95 %, non-condensing		
Installation at altitudes above sea level Maximum installation altitude [3]	0 to 500 m 4,000 m		
Degree of pollution according to EN 60664-1	2 (non-conductive material)		
Overvoltage category according to IEC 60364-4-443:1999	III		
EN 60529 protection	IP20		

Table 30: Technical data for 8B0C control supply units 800W (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8B0C0320HW00.000-1 8B0C0320HC00.000-1	8B0C0320HW00.002-1 8B0C0320HC00.002-1	--- 8B0C0160HC00.A01-1
Storage and transport conditions			
Storage temperature	-25 to +55 °C		
Relative humidity during storage	5 to 95 %, non-condensing		
Transport temperature	-25 to +70 °C		
Relative humidity during transport	95 % at +40 °C		
Mechanical characteristics			
Dimensions [4] Width Height Depth Wall mounting Cold-plate Feed-through mounting	 53 mm 317 mm 263 mm 212 mm 209 mm		
Weight Wall mounting Cold-plate Feed-through mounting	 In preparation approx. 2.6 kg approx. 2.6 kg		

Table 30: Technical data for 8B0C control supply units 800W (cont.)

1) Valid in the following conditions: 55 °C ambient temperature, installation altitude< 500 m above sea level.
2) The output and any connected loads are not actively discharged when switching off.
3) Continuous operation of ACOPOSmulti control supply units at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous power reductions listed into consideration). Additional requirements are to be arranged with B&R.
4) The dimensions define the true device dimensions including the respective mounting plate. Make sure to leave additional space above and below the device for mounting, connections and air circulation (see section 2 "Dimension diagrams and installation dimensions" on page 96).

9. Inverter modules 8BVI 1kW ... 8kW (single-axis modules)

9.1 Order data

Model number	Short description	Image
	Wall mounting	8BVI0055HCS0.000-1
8BVI0014HWS0.000-1	ACOPOSmulti inverter module 1.4A, 800V, Wall mounting	
8BVI0028HWS0.000-1	ACOPOSmulti inverter module 2.8A, 800V, Wall mounting	
8BVI0055HWS0.000-1	ACOPOSmulti inverter module 5.5A, 800V, Wall mounting	
8BVI0110HWS0.000-1	ACOPOSmulti inverter module 11A, 800V, Wall mounting	
	Cold plate or feed-through mounting	
8BVI0014HCS0.000-1	ACOPOSmulti inverter module 1.4A, 800V, Cold plate or feed-through mounting	
8BVI0028HCS0.000-1	ACOPOSmulti inverter module 2.8A, 800V, Cold plate or feed-through mounting	
8BVI0055HCS0.000-1	ACOPOSmulti inverter module 5.5A, 800V, Cold plate or feed-through mounting	
8BVI0110HCS0.000-1	ACOPOSmulti inverter module 11A, 800V, Cold plate or feed-through mounting	

Table 31: Order data - 8BVI inverter modules, 1kW ... 8kW (single-axis modules)

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8TB2106.2010-00	1	Screw terminal 6 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X1 connection	193
8TB2108.2010-00	1	Screw terminal 8 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X2 connection	193
8TB2104.203L-00	1	Screw terminal 4 pins, 1 row RM5,08 Label 3: T- T+ B- B+ Coding L: 1010	Plug for X4A connection	193
8TB3104.204G-00	1	Screw terminal 4 pins, 1 row RM7,62 Label 4: PE W V U Coding G: 0110	Plug for X5A connection	193

Table 32: Required accessory for 8BVI inverter modules, 1kW ... 8kW (single-axis modules)

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8BAC0120.000-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.1 interface	---	78
8BAC0120.001-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.2 interface	---	85
8BAC0122.000-1	max. 2	ACOPOSmulti plug-in module, Resolver interface	---	87
8BAC0124.000-1	max. 2	ACOPOSmulti plug-in module, SinCos interface	---	91
8SCS005.0000-00	Up to 2	Shield component set consisting of: 1 slot cover shield sheet	Shield sheet for covering free plug-in module slots	---
8SCS002.0000-00	1	Shield component set consisting of: 1 clamping plate 2 clamps D 4-13.5mm 2 screws	Shield component set for I/O cable with a cable diameter of 4 - 13.5 mm	---
8SCS000.0000-00	1	Shield component set consisting of: 1 shield plate 1x type 0 1 hose clamp, W 9mm, D 12-22mm	Shield component set for motor cables with a cable diameter of 12 - 22 mm	---

Table 33: Optional accessory for 8BVI inverter modules, 1kW ... 8kW (single-axis modules)

9.2 Technical data

Product ID **Wall mounting** **Cold plate or feed-through mounting**	**8BVI0014HWS0.000-1** **8BVI0014HCS0.000-1**	**8BVI0028HWS0.000-1** **8BVI0028HCS0.000-1**	**8BVI0055HWS0.000-1** **8BVI0055HCS0.000-1**	**8BVI0110HWS0.000-1** **8BVI0110HCS0.000-1**
General information				
C-UL-US listed	In preparation			
Available cooling and mounting methods Wall mounting Cold plate or feed-through mounting	 Yes Yes			
Module width	1			
DC bus				
Voltage Max.	800 VDC 900 VDC			
Continuous power consumption	In preparation	In preparation	In preparation	In preparation
Power loss at max. device power	In preparation	In preparation	In preparation	In preparation
DC bus capacitance	165 µF			330 µF
Design	ACOPOSmulti backplane			
24 VDC supply				
Input voltage	25 VDC ± 1.6 %			
Input capacitance	In preparation			
Power consumption	In preparation			

Table 34: Technical data - 8BVI inverter modules, 1kW ... 8kW (single-axis modules)

Product ID Wall mounting Cold plate or feed-through mounting	8BVI0014HWS0.000-1 8BVI0014HCS0.000-1	8BVI0028HWS0.000-1 8BVI0028HCS0.000-1	8BVI0055HWS0.000-1 8BVI0055HCS0.000-1	8BVI0110HWS0.000-1 8BVI0110HCS0.000-1
Design	ACOPOSmulti backplane			
Motor connector				
Continuous power [1]	1 kW	2 kW	4 kW	8 kW
Continuous current	1.93 A_{eff}	3.86 A_{eff}	7.6 A_{eff}	11 A_{eff}
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation	In preparation	In preparation	In preparation
Reduction of continuous current depending on the switching frequency Switching frequency 20 kHz Switching frequency 10 kHz Switching frequency 5 kHz	 In preparation In preparation No reduction	 In preparation In preparation No reduction	 In preparation In preparation No reduction	 In preparation In preparation No reduction
Reduction of continuous power depending on altitude Starting at 500 m above sea level	0.19 A_{eff} per 1,000 m	0.39 A_{eff} per 1,000 m	0.76 A_{eff} per 1,000 m	1.1 A_{eff} per 1,000 m
Reduction of continuous current depending on cooling method Wall mounting Cold plate or feed-through mounting	 In preparation In preparation	 In preparation In preparation	 In preparation In preparation	 In preparation In preparation
Maximum current	3.4 A_{eff}	6.9 A_{eff}	13.7 A_{eff}	27.5 A_{eff}
Rated switching frequency	5 kHz			
Possible switching frequencies	5 / 10 / 20 kHz			
Protective measures Overload protection Short circuit and ground fault	 Yes Yes			
Maximum motor line length depending on the switching frequency [2] Switching frequency 5 kHz Switching frequency 10 kHz Switching frequency 20 kHz	 25 m 25 m 10 m			
Design U, V, W, PE Shield connection	 Connectors Yes			
Terminal connection cross sections Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 0.25 - 4 mm² 30 - 10 28 - 10			
Terminal cable outer-cross-section dimension of the shield connection	12 - 22 mm			

Table 34: Technical data - 8BVI inverter modules, 1kW ... 8kW (single-axis modules) (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8BVI0014HWS0.000-1 8BVI0014HCS0.000-1	8BVI0028HWS0.000-1 8BVI0028HCS0.000-1	8BVI0055HWS0.000-1 8BVI0055HCS0.000-1	8BVI0110HWS0.000-1 8BVI0110HCS0.000-1
Motor holding brake connection				
Output voltage	24 VDC +5.8 % / +0.2 %			
Continuous current	1.1 A			
Max. internal resistance	0,5 Ω			
Extinction potential	approx. 30 V			
Max. extinction energy per connection	1.5 Ws			
Max. switching frequency	0.5 Hz			
Protective measures Overload and short circuit protection Cable breakage monitoring Undervoltage monitoring	 Yes Yes Yes			
Max. over-current limitation	8 A			
Response threshold for cable breakage monitoring	approx. 0.25 A			
Response threshold for undervoltage monitoring	24 VDC +0 % / -5 %			
Trigger inputs				
Number of inputs	2			
Wiring	Sink			
Electrical isolation Input - inverter module Input - Input	 Yes Yes			
Input voltage Rated Maximum	 24 VDC 30 VDC			
Switching threshold LOW HIGH	 <5 V >15 V			
Input current at rated voltage	approx. 10 mA			
Switching delay Positive edge Negative edge	 52 µs ± 0.5 µs (digitally filtered) 53 µs ± 0.5 µs (digitally filtered)			
Modulation compared to ground potential	Max. ±38 V			
24 V Out				
Amount	2			
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	 25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %			
Fuse protection	500 mA (slow-blow) electronic, automatic reset			

Table 34: Technical data - 8BVI inverter modules, 1kW ... 8kW (single-axis modules) (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8BVI0014HWS0.000-1 8BVI0014HCS0.000-1	8BVI0028HWS0.000-1 8BVI0028HCS0.000-1	8BVI0055HWS0.000-1 8BVI0055HCS0.000-1	8BVI0110HWS0.000-1 8BVI0110HCS0.000-1
Enable inputs				
Number of inputs	2			
Wiring	Sink			
Electrical isolation Input - inverter module Input - Input	 Yes Yes			
Input voltage Rated Maximum	 24 VDC 30 VDC			
Switching threshold LOW HIGH	 <5 V >15 V			
Input current at rated voltage	approx. 30 mA			
Switching delay Enable 1 -> 0, PWM off Enable 0 -> 1, Ready for PWM	 Max. 2.0 ms Max. 100 µs			
Modulation compared to ground potential	Max. ±38 V			
Operational conditions				
Ambient temperature during operation Max. ambient temperature [3]	0 to 40 °C +55 °C			
Relative humidity during operation	5 to 95 %, non-condensing			
Installation at altitudes above sea level Maximum installation altitude [4]	0 to 500 m 4,000 m			
Degree of pollution according to EN 60664-1	2 (non-conductive material)			
Overvoltage category according to IEC 60364-4-443:1999	III			
EN 60529 protection	IP20			
Storage and transport conditions				
Storage temperature	-25 to +55 °C			
Relative humidity during storage	5 to 95 %, non-condensing			
Transport temperature	-25 to +70 °C			
Relative humidity during transport	95 % at +40 °C			

Table 34: Technical data - 8BVI inverter modules, 1kW ... 8kW (single-axis modules) (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8BVI0014HWS0.000-1 8BVI0014HCS0.000-1	8BVI0028HWS0.000-1 8BVI0028HCS0.000-1	8BVI0055HWS0.000-1 8BVI0055HCS0.000-1	8BVI0110HWS0.000-1 8BVI0110HCS0.000-1
Mechanical characteristics				
Dimensions [5] Width Height Depth Wall mounting Cold-plate Feed-through mounting	53 mm 317 mm 263 mm 212 mm 209 mm			
Weight Wall mounting Cold-plate Feed-through mounting	In preparation In preparation In preparation	In preparation In preparation In preparation	In preparation approx. 2.25 kg approx. 2.25 kg	In preparation In preparation In preparation

Table 34: Technical data - 8BVI inverter modules, 1kW ... 8kW (single-axis modules) (cont.)

1) The continuous power and continuous current applies to the following boundary conditions: Nominal DC bus voltage 800 VDC, nominal switching frequency 5 kHz, 40 °C ambient temperature, installation altitudes < 500 m above sea level.
2) To avoid exceeding the EMC limit values, the maximum motor cable length per motor connection is reduced at switching frequencies > 10 kHz.

Information:

When using two motor cables that are connected in parallel, the maximum permissible motor cable lengths are reduced by

The total length of all motor cables per backplane module is limited (see section 3 "Line filter 8BVF" on page 30).

3) Continuous operation of ACOPOSmulti inverter modules at ambient temperatures ranging from 40 °C to max. 55 °C is possible (taking the continuous current reductions listed into consideration), but results in a shorter lifespan.
4) Continuous operation of ACOPOSmulti inverter modules at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous current reductions listed into consideration). Additional requirements are to be arranged with B&R.
5) The dimensions define the true device dimensions including the respective mounting plate. Make sure to leave additional space above and below the device for mounting, connections and air circulation (see section 2 "Dimension diagrams and installation dimensions" on page 96).

10. Inverter modules 8BVI 1kW ... 4kW (two-axis modules)

10.1 General information

Double axis modules contain two complete standalone inverters in an inverter module.

10.2 Order data

Model number	Short description	Image
	Wall mounting	8BVI0055HCD0.000-1
8BVI0014HWD0.000-1	ACOPOSmulti inverter module 1.4A, 800V, Wall mounting, 2 axes	
8BVI0028HWD0.000-1	ACOPOSmulti inverter module 2.8A, 800V, Wall mounting, 2 axes	
8BVI0055HWD0.000-1	ACOPOSmulti inverter module 5.5A, 800V, Wall mounting, 2 axes	
	Cold plate or feed-through mounting	
8BVI0014HCD0.000-1	ACOPOSmulti inverter module 1.4A, 800V, Cold plate or feed-through mounting, 2 axes	
8BVI0028HCD0.000-1	ACOPOSmulti inverter module 2.8A, 800V, Cold plate or feed-through mounting, 2 axes	
8BVI0055HCD0.000-1	ACOPOSmulti inverter module 5.5A, 800V, Cold plate or feed-through mounting, 2 axes	

Table 35: Order data - 8BVI inverter modules, 1kW ... 4kW (two-axis modules)

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8TB2112.2010-00	1	Screw terminal 12 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X1 connection	196
8TB2108.2010-00	1	Screw terminal 8 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X2 connection	193
8TB2104.203L-00	1	Screw terminal 4 pins, 1 row RM5,08 Label 3: T- T+ B- B+ Coding L: 1010	Plug for X4A connection	193
8TB2104.203F-00	1	Screw terminal 4 pins, 1 row RM5,08 Label 3: T- T+ B- B+ Coding F: 0101	Plug for X4B connection	196
8TB3104.204G-00	1	Screw terminal 4 pins, 1 row RM7,62 Label 4: PE W V U Coding G: 0110	Plug for X5A connection	193
8TB3104.204K-00	1	Screw terminal 4 pins, 1 row RM7,62 Label 4: PE W V U Coding K: 1001	Plug for X5B connection	196

Table 36: Required accessory for 8BVI inverter modules, 1kW ... 4kW (two-axis modules)

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8BAC0120.000-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.1 interface	---	78
8BAC0120.001-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.2 interface	---	85
8BAC0122.000-1	max. 2	ACOPOSmulti plug-in module, Resolver interface	---	87
8BAC0124.000-1	max. 2	ACOPOSmulti plug-in module, SinCos interface	---	91
8SCS005.0000-00	Up to 2	Shield component set consisting of: 1 slot cover shield sheet	Shield sheet for covering free plug-in module slots	---
8SCS002.0000-00	1	Shield component set consisting of: 1 clamping plate 2 clamps D 4-13.5mm 2 screws	Shield component set for I/O cable with a cable diameter of 4 - 13.5 mm	---
8SCS000.0000-00	Up to 2	Shield component set consisting of: 1 shield plate 1x type 0 1 hose clamp, W 9mm, D 12-22mm	Shield component set for motor cables with a cable diameter of 12 - 22 mm	---

Table 37: Optional accessory for 8BVI inverter modules, 1kW ... 4kW (two-axis modules)

10.3 Technical data

Product ID **Wall mounting** **Cold plate or feed-through mounting**	**8BVI0014HWD0.000-1** **8BVI0014HCD0.000-1**	**8BVI0028HWD0.000-1** **8BVI0028HCD0.000-1**	**8BVI0055HWD0.000-1** **8BVI0055HCD0.000-1**
General information			
C-UL-US listed	In preparation		
Available cooling and mounting methods Wall mounting Cold plate or feed-through mounting	 Yes Yes		
Module width	1		
DC bus			
Voltage Max.	800 VDC 900 VDC		
Continuous power consumption	In preparation	In preparation	In preparation
Power loss at max. device power	In preparation	In preparation	In preparation
DC bus capacitance	165 µF		330 µF
Design	ACOPOSmulti backplane		
24 VDC supply			
Input voltage	25 VDC ± 1.6 %		
Input capacitance	In preparation		
Power consumption	In preparation		
Design	ACOPOSmulti backplane		

Table 38: Technical data - 8BVI inverter modules, 1kW ... 4kW (two-axis modules)

Product ID Wall mounting Cold plate or feed-through mounting	8BVI0014HWD0.000-1 8BVI0014HCD0.000-1	8BVI0028HWD0.000-1 8BVI0028HCD0.000-1	8BVI0055HWD0.000-1 8BVI0055HCD0.000-1
Motor connector			
Continuous power [1]	1 kW	2 kW	4 kW
Continuous current	1.93 A_{eff}	3.86 A_{eff}	7.6 A_{eff}
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation	In preparation	In preparation
Reduction of continuous current depending on the switching frequency Switching frequency 20 kHz Switching frequency 10 kHz Switching frequency 5 kHz	 In preparation In preparation No reduction	 In preparation In preparation No reduction	 In preparation In preparation No reduction
Reduction of continuous power depending on altitude Starting at 500 m above sea level	0.19 A_{eff} per 1,000 m	0.39 A_{eff} per 1,000 m	0.76 A_{eff} per 1,000 m
Reduction of continuous current depending on cooling method Wall mounting Cold plate or feed-through mounting	 In preparation In preparation	 In preparation In preparation	 In preparation In preparation
Maximum current	3.4 A_{eff}	6.9 A_{eff}	13.7 A_{eff}
Rated switching frequency	5 kHz		
Possible switching frequencies	5 / 10 / 20 kHz		
Protective measures Overload protection Short circuit and ground fault	 Yes Yes		
Maximum motor line length depending on the switching frequency [2] Switching frequency 5 kHz Switching frequency 10 kHz Switching frequency 20 kHz	 25 m 25 m 10 m		
Design U, V, W, PE Shield connection	 Connectors Yes		
Terminal connection cross sections Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 0.25 - 4 mm² 30 - 10 28 - 10		
Terminal cable outer-cross-section dimension of the shield connection	12 - 22mm		

Table 38: Technical data - 8BVI inverter modules, 1kW ... 4kW (two-axis modules) (cont.)

Product ID **Wall mounting** **Cold plate or feed-through mounting**	**8BVI0014HWD0.000-1** **8BVI0014HCD0.000-1**	**8BVI0028HWD0.000-1** **8BVI0028HCD0.000-1**	**8BVI0055HWD0.000-1** **8BVI0055HCD0.000-1**
Motor holding brake connection			
Output voltage	24 VDC +5.8 % / +0.2 %		
Continuous current	1.1 A		
Max. internal resistance	0,5 Ω		
Extinction potential	approx. 30 V		
Max. extinction energy per connection	1.5 Ws		
Max. switching frequency	0.5 Hz		
Protective measures Overload and short circuit protection Cable breakage monitoring Undervoltage monitoring	 Yes Yes Yes		
Max. over-current limitation	8 A		
Response threshold for cable breakage monitoring	approx. 0.25 A		
Response threshold for undervoltage monitoring	24 VDC +0 % / -5 %		
Trigger inputs			
Number of inputs	2		
Wiring	Sink		
Electrical isolation Input - inverter module Input - Input	 Yes Yes		
Input voltage Rated Maximum	 24 VDC 30 VDC		
Switching threshold LOW HIGH	 <5 V >15 V		
Input current at rated voltage	approx. 10 mA		
Switching delay Positive edge Negative edge	 52 µs ± 0.5 µs (digitally filtered) 53 µs ± 0.5 µs (digitally filtered)		
Modulation compared to ground potential	Max. ±38 V		
24 VDC Out			
Amount	2		
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	 25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %		
Fuse protection	500 mA (slow-blow) electronic, automatic reset		

Table 38: Technical data - 8BVI inverter modules, 1kW ... 4kW (two-axis modules) (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8BVI0014HWD0.000-1 8BVI0014HCD0.000-1	8BVI0028HWD0.000-1 8BVI0028HCD0.000-1	8BVI0055HWD0.000-1 8BVI0055HCD0.000-1
Enable inputs			
Number of inputs	2		
Wiring	Sink		
Electrical isolation Input - inverter module Input - Input	 Yes Yes		
Input voltage Rated Maximum	 24 VDC 30 VDC		
Switching threshold LOW HIGH	 <5 V >15 V		
Input current at rated voltage	approx. 30 mA		
Switching delay Enable 1 -> 0, PWM off Enable 0 -> 1, Ready for PWM	 Max. 2.0 ms Max. 100 µs		
Modulation compared to ground potential	Max. ±38 V		
Operational conditions			
Ambient temperature during operation Max. ambient temperature [3]	0 to 40 °C +55 °C		
Relative humidity during operation	5 to 95 %, non-condensing		
Installation at altitudes above sea level Maximum installation altitude [4]	0 to 500 m 4,000 m		
Degree of pollution according to EN 60664-1	2 (non-conductive material)		
Overvoltage category according to IEC 60364-4-443:1999	III		
EN 60529 protection	IP20		
Storage and transport conditions			
Storage temperature	-25 to +55 °C		
Relative humidity during storage	5 to 95 %, non-condensing		
Transport temperature	-25 to +70 °C		
Relative humidity during transport	95 % at +40 °C		

Table 38: Technical data - 8BVI inverter modules, 1kW ... 4kW (two-axis modules) (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	8BVI0014HWD0.000-1 8BVI0014HCD0.000-1	8BVI0028HWD0.000-1 8BVI0028HCD0.000-1	8BVI0055HWD0.000-1 8BVI0055HCD0.000-1
Mechanical characteristics			
Dimensions [5] Width Height Depth Wall mounting Cold-plate Feed-through mounting	53 mm 317 mm 263 mm 212 mm 209 mm		
Weight Wall mounting Cold-plate Feed-through mounting	 In preparation In preparation In preparation	 In preparation In preparation In preparation	 In preparation approx. 2.25 kg approx. 2.25 kg

Table 38: Technical data - 8BVI inverter modules, 1kW ... 4kW (two-axis modules) (cont.)

1) The continuous power and continuous current applies to the following boundary conditions: Nominal DC bus voltage 800 VDC, nominal switching frequency 5 kHz, 40 °C ambient temperature, installation altitudes < 500 m above sea level.
2) To avoid exceeding the EMC limit values, the maximum motor cable length per motor connection is reduced at switching frequencies > 10 kHz.

Information:

When using two motor cables that are connected in parallel, the maximum permissible motor cable lengths are reduced by

The total length of all motor cables per backplane module is limited (see section 3 "Line filter 8BVF" on page 30).

3) Continuous operation of ACOPOSmulti inverter modules at ambient temperatures ranging from 40 °C to max. 55 °C is possible (taking the continuous current reductions listed into consideration), but results in a shorter lifespan.
4) Continuous operation of ACOPOSmulti inverter modules at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous current reductions listed into consideration). Additional requirements are to be arranged with B&R.
5) The dimensions define the true device dimensions including the respective mounting plate. Make sure to leave additional space above and below the device for mounting, connections and air circulation (see section 2 "Dimension diagrams and installation dimensions" on page 96).

11. 8BVI inverter modules, 32kW

11.1 Order data

Model number	Short description	Image
	Wall mounting	8BVI0440HCS0.000-1
8BVI0440HWS0.000-1	ACOPOSmulti inverter module 44A, 800V, Wall mounting	
	Cold plate or feed-through mounting	
8BVI0440HCS0.000-1	ACOPOSmulti inverter module 44A, 800V, Cold plate or feed-through mounting	

Table 39: Order data - 8BVI inverter modules, 32kW

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8TB2106.2010-00	1	Screw terminal 6 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X1 connection	193
8TB2108.2010-00	1	Screw terminal 8 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X2 connection	193
8TB2104.203L-00	1	Screw terminal 4 pins, 1 row RM5,08 Label 3: T- T+ B- B+ Coding L: 1010	Plug for X4A connection	193
8TB4104.204G-00	1	Screw terminal 4 pins, 1 row RM10,16 Label 4: PE W V U Coding G: 0110	Plug for X5A connection	193

Table 40: Required accessory for 8BVI inverter modules, 32kW

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8BAC0120.000-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.1 interface	---	78
8BAC0120.001-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.2 interface	---	85
8BAC0122.000-1	max. 2	ACOPOSmulti plug-in module, Resolver interface	---	87
8BAC0124.000-1	max. 2	ACOPOSmulti plug-in module, SinCos interface	---	91
8SCS005.0000-00	Up to 2	Shield component set consisting of: 1 slot cover shield sheet	Shield sheet for covering free plug-in module slots	---
8SCS002.0000-00	1	Shield component set consisting of: 1 clamping plate 2 clamps D 4-13.5mm 2 screws	Shield component set for I/O cable with a cable diameter of 4 - 13.5 mm	---
In preparation	1	Shield component set consisting of: 1 shield plate 1x type 1 1 hose clamp, W 9mm, D 23-35mm	Shield component set for motor cables with a cable diameter of 23 - 35 mm	---

Table 41: Optional accessory for 8BVI inverter modules, 32kW

11.2 Technical data

Product ID **Wall mounting** **Cold plate or feed-through mounting**	**8BVI0440HWS0.000-1** **8BVI0440HCS0.000-1**
General information	
C-UL-US listed	In preparation
Available cooling and mounting methods Wall mounting Cold plate or feed-through mounting	 Yes Yes
Module width	2
DC bus	
Voltage Max.	800 VDC 900 VDC
Continuous power consumption	In preparation
Power loss at max. device power	In preparation
DC bus capacitance	In preparation
Design	ACOPOSmulti backplane
24 VDC supply	
Input voltage	25 VDC ± 1.6 %
Input capacitance	In preparation
Power consumption	In preparation

Table 42: Technical data - 8BVI inverter modules, 32kW

Product ID **Wall mounting** **Cold plate or feed-through mounting**	 **8BVI0440HWS0.000-1** **8BVI0440HCS0.000-1**
Design	ACOPOSmulti backplane
Motor connector	
Continuous power [1]	32 kW
Continuous current	43.9 A_{eff}
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation
Reduction of continuous current depending on the switching frequency Switching frequency 20 kHz Switching frequency 10 kHz Switching frequency 5 kHz	 In preparation In preparation No reduction
Reduction of continuous power depending on altitude Starting at 500 m above sea level	 4.39 A_{eff} per 1,000 m
Reduction of continuous current depending on cooling method Wall mounting Cold plate or feed-through mounting	 In preparation In preparation
Maximum current	87.9 A_{eff}
Rated switching frequency	5 kHz
Possible switching frequencies	5 / 10 / 20 kHz
Protective measures Overload protection Short circuit and ground fault	 Yes Yes
Maximum motor line length depending on the switching frequency [2] Switching frequency 5 kHz Switching frequency 10 kHz Switching frequency 20 kHz	 In preparation In preparation In preparation
Design U, V, W, PE Shield connection	 Connectors Yes
Terminal connection cross sections Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 0.5 - 16 mm² 20 - 6 20 - 6
Terminal cable outer-cross-section dimension of the shield connection	23 - 35 mm

Table 42: Technical data - 8BVI inverter modules, 32kW (cont.)

Product ID **Wall mounting** **Cold plate or feed-through mounting**	 **8BVI0440HWS0.000-1** **8BVI0440HCS0.000-1**
Motor holding brake connection	
Output voltage	24 VDC +5.8 % / -0.1 %
Continuous current	4.2 A
Max. internal resistance	0,15 Ω
Extinction potential	approx. 30 V
Max. extinction energy per connection	3 Ws
Max. switching frequency	0.5 Hz
Protective measures Overload and short circuit protection Cable breakage monitoring Undervoltage monitoring	 Yes Yes Yes
Max. over-current limitation	10 A
Response threshold for cable breakage monitoring	approx. 0.5 A
Response threshold for undervoltage monitoring	24 VDC +0 % / -5 %
Trigger inputs	
Number of inputs	2
Wiring	Sink
Electrical isolation Input - inverter module Input - Input	 Yes Yes
Input voltage Rated Maximum	 24 VDC 30 VDC
Switching threshold LOW HIGH	 <5 V >15 V
Input current at rated voltage	approx. 10 mA
Switching delay Positive edge Negative edge	 52 µs ± 0.5 µs (digitally filtered) 53 µs ± 0.5 µs (digitally filtered)
Modulation compared to ground potential	Max. ±38 V
24 V Out	
Amount	2
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	 25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %
Fuse protection	500 mA (slow-blow) electronic, automatic reset

Table 42: Technical data - 8BVI inverter modules, 32kW (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	 8BVI0440HWS0.000-1 8BVI0440HCS0.000-1
Enable inputs	
Number of inputs	2
Wiring	Sink
Electrical isolation Input - inverter module Input - Input	 Yes Yes
Input voltage Rated Maximum	 24 VDC 30 VDC
Switching threshold LOW HIGH	 <5 V >15 V
Input current at rated voltage	approx. 30 mA
Switching delay Enable 1 -> 0, PWM off Enable 0 -> 1, Ready for PWM	 Max. 2.0 ms Max. 100 µs
Modulation compared to ground potential	Max. ±38 V
Operational conditions	
Ambient temperature during operation Max. ambient temperature [3]	0 to 40 °C +55 °C
Relative humidity during operation	5 to 95 %, non-condensing
Installation at altitudes above sea level Maximum installation altitude [4]	0 to 500 m 4,000 m
Degree of pollution according to EN 60664-1	2 (non-conductive material)
Overvoltage category according to IEC 60364-4-443:1999	III
EN 60529 protection	IP20
Storage and transport conditions	
Storage temperature	-25 to +55 °C
Relative humidity during storage	5 to 95 %, non-condensing
Transport temperature	-25 to +70 °C
Relative humidity during transport	95 % at +40 °C

Table 42: Technical data - 8BVI inverter modules, 32kW (cont.)

Product ID	
Wall mounting **Cold plate or feed-through mounting**	**8BVI0440HWS0.000-1** **8BVI0440HCS0.000-1**
Mechanical characteristics	
Dimensions [5]	
Width	106.5 mm
Height	317 mm
Depth	
Wall mounting	263 mm
Cold-plate	212 mm
Feed-through mounting	209 mm
Weight	
Wall mounting	In preparation
Cold-plate	In preparation
Feed-through mounting	In preparation

Table 42: Technical data - 8BVI inverter modules, 32kW (cont.)

1) The continuous power and continuous current applies to the following boundary conditions: Nominal DC bus voltage 800 VDC, nominal switching frequency 5 kHz, 40 °C ambient temperature, installation altitudes < 500 m above sea level.

2)

Information:

When using two motor cables that are connected in parallel, the maximum permissible motor cable lengths are reduced by

The total length of all motor cables per backplane module is limited (see section 3 "Line filter 8BVF" on page 30).

3) Continuous operation of ACOPOSmulti inverter modules at ambient temperatures ranging from 40 °C to max. 55 °C is possible (taking the continuous current reductions listed into consideration), but results in a shorter lifespan.

4) Continuous operation of ACOPOSmulti inverter modules at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous current reductions listed into consideration). Additional requirements are to be arranged with B&R.

5) The dimensions define the true device dimensions including the respective mounting plate. Make sure to leave additional space above and below the device for mounting, connections and air circulation (see section 2 "Dimension diagrams and installation dimensions" on page 96).

12. 8BVI inverter modules, 64kW

12.1 Order data

Model number	Short description	Image
	Wall mounting	8BVI0880HCS0.000-1
8BVI0880HWS0.000-1	ACOPOSmulti inverter module 88A, 800V, Wall mounting	
	Cold plate or feed-through mounting	
8BVI0880HCS0.000-1	ACOPOSmulti inverter module 88A, 800V, Cold plate or feed-through mounting	

Table 43: Order data - 8BVI inverter modules, 64kW

Required accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8TB2106.2010-00	1	Screw terminal 6 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X1 connection	193
8TB2108.2010-00	1	Screw terminal 8 pins, 1 row RM5,08 Label 1: numbered serially	Plug for X2 connection	193
8TB2104.203L-00	1	Screw terminal 4 pins, 1 row RM5,08 Label 3: T- T+ B- B+ Coding L: 1010	Plug for X4A connection	193

Table 44: Required accessory for 8BVI inverter modules, 64kW

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8BAC0120.000-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.1 interface	---	78
8BAC0120.001-1	max. 2	ACOPOSmulti plug-in module, EnDat 2.2 interface	---	85
8BAC0122.000-1	max. 2	ACOPOSmulti plug-in module, Resolver interface	---	87
8BAC0124.000-1	max. 2	ACOPOSmulti plug-in module, SinCos interface	---	91
8SCS005.0000-00	Up to 2	Shield component set consisting of: 1 slot cover shield sheet	Shield sheet for covering free plug-in module slots	---
8SCS002.0000-00	1	Shield component set consisting of: 1 clamping plate 2 clamps D 4-13.5mm 2 screws	Shield component set for I/O cable with a cable diameter of 4 - 13.5 mm	---
8SCS003.0000-00	1	Shield component set consisting of: 1 shield mounting plate, 4x, 45° 8 screws	Base plate for mounting shield component set 8SCS001.0000-00 or 8SCS004.0000-00	---
8SCS004.0000-00	1	Shield component set consisting of: 1 shield plate, 4x, type 0 2 hose clamp, W 9mm, D 32-50mm	Shield component set for motor cables with a cable diameter of 32 - 50 mm	---
8SCS001.0000-00	3	Shield component set consisting of: 1 shield plate, 4x, type 1 1 hose clamp, W 9mm, D 12-22mm	Shield component set for individual wires with a diameter of 12 - 22 mm	---

Table 45: Optional accessory for 8BVI inverter modules, 64kW

12.2 Technical data

Product ID **Wall mounting** **Cold plate or feed-through mounting**	 **8BVI0880HWS0.000-1** **8BVI0880HCS0.000-1**
General information	
C-UL-US listed	In preparation
Available cooling and mounting methods Wall mounting Cold plate or feed-through mounting	 Yes Yes
Module width	2
DC bus	
Voltage Max.	800 VDC 900 VDC
Continuous power consumption	In preparation
Power loss at max. device power	In preparation
DC bus capacitance	1980 µF
Design	ACOPOSmulti backplane

Table 46: Technical data - 8BVI inverter modules, 64kW

Product ID **Wall mounting** **Cold plate or feed-through mounting**	 **8BVI0880HWS0.000-1** **8BVI0880HCS0.000-1**
24 VDC supply	
Input voltage	25 VDC ± 1.6 %
Input capacitance	In preparation
Power consumption	In preparation
Design	ACOPOSmulti backplane
Motor connector	
Continuous power [1]	64 kW
Continuous current	87.9 A_{eff}
Reduction of continuous current according to the ambient temperature above 40 °C	In preparation
Reduction of continuous current depending on the switching frequency Switching frequency 20 kHz Switching frequency 10 kHz Switching frequency 5 kHz	 In preparation In preparation No reduction
Reduction of continuous power depending on altitude Starting at 500 m above sea level	 8.79 A_{eff} per 1,000 m
Reduction of continuous current depending on cooling method Wall mounting Cold plate or feed-through mounting	 In preparation In preparation
Maximum current	176 A_{eff}
Rated switching frequency	5 kHz
Possible switching frequencies	5 / 10 / 20 kHz
Protective measures Overload protection Short circuit and ground fault	 Yes Yes
Maximum motor line length depending on the switching frequency [2] Switching frequency 5 kHz Switching frequency 10 kHz Switching frequency 20 kHz	 25 m 25 m 25 m
Design U, V, W, PE Shield connection	 Threaded bolt M8 Yes
Terminal connection cross sections Flexible and fine wire lines with wire tip sleeves Approbation data UL/C-UL-US CSA	 6 - 50 mm² [3] In preparation In preparation
Terminal cable outer-cross-section dimension of the shield connection	32 - 50 mm

Table 46: Technical data - 8BVI inverter modules, 64kW (cont.)

Product ID **Wall mounting** **Cold plate or feed-through mounting**	 **8BVI0880HWS0.000-1** **8BVI0880HCS0.000-1**
Motor holding brake connection	
Output voltage	24 VDC +5.8 % / -0.1 %
Continuous current	4.2 A
Max. internal resistance	0,15 Ω
Extinction potential	approx. 30 V
Max. extinction energy per connection	3 Ws
Max. switching frequency	0.5 Hz
Protective measures Overload and short circuit protection Cable breakage monitoring Undervoltage monitoring	 Yes Yes Yes
Max. over-current limitation	10 A
Response threshold for cable breakage monitoring	approx. 0.5 A
Response threshold for undervoltage monitoring	24 VDC +0 % / -5 %
Trigger inputs	
Number of inputs	2
Wiring	Sink
Electrical isolation Input - inverter module Input - Input	 Yes Yes
Input voltage Rated Maximum	 24 VDC 30 VDC
Switching threshold LOW HIGH	 <5 V >15 V
Input current at rated voltage	approx. 10 mA
Switching delay Positive edge Negative edge	 52 µs ± 0.5 µs (digitally filtered) 53 µs ± 0.5 µs (digitally filtered)
Modulation compared to ground potential	Max. ±38 V
24 V Out	
Amount	2
Output voltage DC bus voltage 260 ... 315 VDC DC bus voltage 315 ... 900 VDC	 25 VDC * (DC bus voltage / 315) 24 VDC ± 6 %
Fuse protection	500 mA (slow-blow) electronic, automatic reset

Table 46: Technical data - 8BVI inverter modules, 64kW (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	 8BVI0880HWS0.000-1 8BVI0880HCS0.000-1
Enable inputs	
Number of inputs	2
Wiring	Sink
Electrical isolation Input - inverter module Input - Input	 Yes Yes
Input voltage Rated Maximum	 24 VDC 30 VDC
Switching threshold LOW HIGH	 <5 V >15 V
Input current at rated voltage	approx. 30 mA
Switching delay Enable 1 -> 0, PWM off Enable 0 -> 1, Ready for PWM	 Max. 2.0 ms Max. 100 µs
Modulation compared to ground potential	Max. ±38 V
Operational conditions	
Ambient temperature during operation Max. ambient temperature [4]	0 to 40 °C +55 °C
Relative humidity during operation	5 to 95 %, non-condensing
Installation at altitudes above sea level Maximum installation altitude [5]	0 to 500 m 4,000 m
Degree of pollution according to EN 60664-1	2 (non-conductive material)
Overvoltage category according to IEC 60364-4-443:1999	III
EN 60529 protection	IP20
Storage and transport conditions	
Storage temperature	-25 to +55 °C
Relative humidity during storage	5 to 95 %, non-condensing
Transport temperature	-25 to +70 °C
Relative humidity during transport	95 % at +40 °C

Table 46: Technical data - 8BVI inverter modules, 64kW (cont.)

Product ID Wall mounting Cold plate or feed-through mounting	 8BVI0880HWS0.000-1 8BVI0880HCS0.000-1
Mechanical characteristics	
Dimensions [6] Width Height Depth Wall mounting Cold-plate Feed-through mounting	 213.5 mm 317 mm 263 mm 212 mm 209 mm
Weight Wall mounting Cold-plate Feed-through mounting	 In preparation approx. 7.05 kg approx. 7.05 kg

Table 46: Technical data - 8BVI inverter modules, 64kW (cont.)

1) The continuous power and continuous current applies to the following boundary conditions: Nominal DC bus voltage 800 VDC, nominal switching frequency 5 kHz, 40 °C ambient temperature, installation altitudes < 500 m above sea level.

2)

Information:

When using two motor cables that are connected in parallel, the maximum permissible motor cable lengths are reduced by

The total length of all motor cables per backplane module is limited (see section 3 "Line filter 8BVF" on page 30).

3) The connection is made with cable lugs using an M8 threaded bolt.

4) Continuous operation of ACOPOSmulti inverter modules at ambient temperatures ranging from 40 °C to max. 55 °C is possible (taking the continuous current reductions listed into consideration), but results in a shorter lifespan.

5) Continuous operation of ACOPOSmulti inverter modules at altitudes ranging from 500 m to 4000 m above sea level is possible (taking the continuous current reductions listed into consideration). Additional requirements are to be arranged with B&R.

6) The dimensions define the true device dimensions including the respective mounting plate. Make sure to leave additional space above and below the device for mounting, connections and air circulation (see section 2 "Dimension diagrams and installation dimensions" on page 96).

13. EnDat 2.1 plug-in module 8BAC0120.000-1

13.1 General description

The EnDat 2.1 plug-in module 8BAC0120.000-1 can be used in an ACOPOSmulti slot. The module is equipped with an EnDat 2.1 interface.

This module can be used to evaluate encoders which are built into B&R servo motors and also encoders for external axes (encoders that evaluate any machine movement). The input signals are monitored. In this way, broken connections, shorted lines and encoder supply failure can be recognized.

EnDat 2.1 encoder:

EnDat 2.1 is a standard developed by Johannes Heidenhain GmbH (www.heidenhain.de), incorporating the advantages of absolute and incremental position measurement and also offers a read/write parameter memory in the encoder. With absolute position measurement (absolute position is read in serially), the homing procedure is usually not required. When necessary, a multi-turn encoder (4096 revolutions) should be installed. To save costs, a single-turn encoder and a reference switch can also be used. In this case, a homing procedure must be carried out.

The incremental process allows the short delay times necessary for position measurement on drives with exceptional dynamic properties. With the sinusoidal incremental signal and the fine resolution in the EnDat 2.1 module, a very high positioning resolution is achieved in spite of the moderate signal frequencies used.

The parameter memory in the EnDat encoder is used by B&R to store motor data (among other things). In this way, the ACOPOSmulti drive system is always automatically provided the correct motor parameters and limit values. This is referred to as the "embedded parameter chip".

During start-up, the module is automatically identified, configured and its parameters set by the ACOPOSmulti drive system's operating system.

13.2 Order data

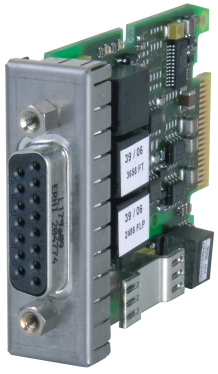
Model number	Short description	Image
8BAC0120.000-1	ACOPOSmulti plug-in module. EnDat 2.1 interface	

Table 47: Order data - EnDat 2.1 plug-in module 8BAC0120.000-1

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8CE005.12-1	1	EnDat cable, length 5m, 10 x 0.14mm² + 2 x 0.5mm², EnDat connector 17-pin Intercontec socket, servo connector 15-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	85
8CE007.12-1	1	EnDat cable, length 7m, 10 x 0.14mm² + 2 x 0.5mm², EnDat connector 17-pin Intercontec socket, servo connector 15-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	85
8CE010.12-1	1	EnDat cable, length 10m, 10 x 0.14mm² + 2 x 0.5mm², EnDat connector 17-pin Intercontec socket, servo connector 15-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	85
8CE015.12-1	1	EnDat cable, length 15m, 10 x 0.14mm² + 2 x 0.5mm², EnDat connector 17-pin Intercontec socket, servo connector 15-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	85
8CE020.12-1	1	EnDat cable, length 20m, 10 x 0.14mm² + 2 x 0.5mm², EnDat connector 17-pin Intercontec socket, servo connector 15-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	85
8CE025.12-1	1	EnDat cable, length 25m, 10 x 0.14mm² + 2 x 0.5mm², EnDat connector 17-pin Intercontec socket, servo connector 15-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	85

Table 48: Optional accessory for EnDat 2.1 plug-in module 8BAC0120.000-1

13.3 Technical data

Product ID	8BAC0120.000-1
General information	
C-UL-US listed	In preparation
Module type	ACOPOSmulti plug-in module
Slot [1]	Slots 1 and 2
Power consumption E0 ... EnDat single-turn, 512 lines E1 ... EnDat multi-turn, 512 lines E2 ... EnDat single-turn, 32 lines (inductive) E3 ... EnDat multi-turn, 32 lines (inductive) E4 ... EnDat single-turn, 512 lines E5 ... EnDat multi-turn, 512 lines	 In preparation In preparation In preparation In preparation In preparation In preparation
Encoder connection [2]	
Connection, module-side	15-pin DSUB socket
Indicators	UP/DN LEDs
Electrical isolation Encoder - ACOPOSmulti	 No
Encoder monitoring	Yes
Maximum encoder cable length	75 m
Encoder supply	
Output voltage	5 V ± 5%
Load capacity	250 mA [3]
Sense lines	2, compensation of max. 2 x 0.7 V
Sine-cosine inputs	
Signal transfer	Differential signals, symmetric
Differential Voltage	0.5 to 1.25 V_{ss}
Common mode voltage	Max. ±7 V
Terminating resistors	120 Ω
Signal frequency (-5 dB)	DC up to 400 kHz
Signal frequency (-3 dB)	DC up to 300 kHz
ADC resolution	12-bit
Synchronous serial interface	
Signal transfer	RS485
Data transfer rate	781.25 kBit/s
Position	
Resolution @ 1 V_{SS} [4]	Number of encoder lines * 5700
Precision [5]	---
Noise [5]	---
Operational conditions	
Ambient temperature during operation	--- [6]

Table 49: Technical data - EnDat 2.1 plug-in module 8BAC0120

Product ID	8BAC0120.000-1
Relative humidity during operation	--- 6)

Table 49: Technical data - EnDat 2.1 plug-in module 8BAC0120 (cont.)

Product ID	8BAC0120.000-1
Storage and transport conditions	
Storage temperature	-25 to +55 °C
Relative humidity during storage	5 to 95 %, non-condensing
Transport temperature	-25 to +70 °C
Relative humidity during transport	95 % at +40 °C

Table 49: Technical data - EnDat 2.1 plug-in module 8BAC0120 (cont.)

1) The 8BAC0120.000-1 is an encoder module. Up to two encoder modules can be connected. In this case, the encoder module in the first slot automatically serves as motor feedback for the first axis and the encoder module in the second slot serves as motor feedback for the second axis. The second slot can be used for other purposes when in single-axis operation.
2) The EnDat encoder must be wired using a cable with a single shield.
3) An additional reserve of 57 mA is available for terminating resistors.
4) This value does not correspond to the encoder resolution that must be configured in Automation Studio (16384 * number of encoder lines).
5) In the field, this is limited by the encoder.
6) ACOPOSmulti plug-in modules can be used in an ACOPOSmulti inverter or power supply module; the corresponding values can be found in the technical data of the respective ACOPOSmulti inverter or power supply module.

13.3.1 Indications

The indicators (UP/DN LEDs) are located on the front of the ACOPOSmulti drive or power supply module where the plug-in module is installed.

The UP/DN LEDs are lit depending on the rotational direction and the speed of the connected encoder. [1)]

UP LED ... indicates when the encoder position changes in the positive direction.
DN LED ... indicates when the encoder position changes in the negative direction.

13.3.2 Firmware

The firmware is part of the operating system for the ACOPOSmulti drive system. The firmware is updated by updating the ACOPOSmulti operating system.

1) The count direction of the encoder can be configured in Automation Studio. However, changing the count direction in Automation Studio does not change the actual count direction of the encoder and therefore does not affect the UP/DN LEDs!

14. HIPERFACE plug-in module 8BAC0121.000-1

14.1 General description

The HIPERFACE plug-in module 8BAC0121.000-1 can be used in an ACOPOSmulti slot. The module is equipped with a HIPERFACE encoder interface.

This module can be used to evaluate encoders which are built into OEM motors and also encoders for external axes (encoders that evaluate any machine movement). The input signals are monitored. In this way, broken connections, shorted lines and encoder supply failure can be recognized.

HIPERFACE is a standard developed by Max Stegmann GmbH (www.stegmann.de), similar to EnDat, incorporating the advantages of absolute and incremental position measurement and also offers a read/write parameter memory in the encoder. With absolute position measurement (absolute position is read in serially), the homing procedure is usually not required. When necessary, a multi-turn encoder (4096 revolutions) should be installed. To save costs, a single-turn encoder and a reference switch can also be used. In this case, a homing procedure must be carried out.

The incremental process allows the short delay times necessary for position measurement on drives with exceptional dynamic properties. With the sinusoidal incremental signal and the fine resolution in the HIPERFACE module, a very high positioning resolution is achieved in spite of the moderate signal frequencies used.

The parameter memory contained in the HIPERFACE encoder is currently not used by B&R. Therefore, the "embedded parameter chip" function is currently not available. [1)]

During start-up, the module is automatically identified, configured and its parameters set by the ACOPOSmulti drive system's operating system.

1) "Embedded parameter chip" function available starting with Firmware version V1.221.

14.2 Order data

Model number	Short description	Image
8BAC0121.000-1	ACOPOSmulti plug-in module. HIPERFACE Interface	

Table 50: Order data for HIPERFACE plug-in module 8BAC0121.000-1

14.3 Technical data

Product ID	8BAC0121.000-1
General information	
C-UL-US listed	In preparation
Module type	ACOPOSmulti plug-in module
Slot [1]	Slots 1 and 2
Encoder connection [2]	
Connection, module-side	15-pin DSUB socket
Indicators	UP/DN LEDs
Electrical isolation Encoder - ACOPOSmulti	 No
Encoder monitoring	Yes
Maximum encoder cable length	75 m
Encoder supply	
Output voltage	Typ. 10 V
Load capacity	130 mA [3]
Sense lines	--- [4]
Protective measures Overload protection Short circuit protection	 Yes Yes

Table 51: Technical data - HIPERFACE plug-in module 8BAC0121

Product ID	8BAC0121.000-1
Sine-cosine inputs	
Signal transfer	Differential signal, asymmetric
Differential Voltage	0.5 to 1.25 V_{ss}
Common mode voltage	Max. ±7 V
Terminating resistors	120 Ω
Signal frequency	DC up to 200 kHz
ADC resolution	12-bit
Asynchronous serial interface	
Signal transfer	RS485
Data transfer rate	9600 bit/s
Position	
Resolution @ 1 V_{SS} 5)	Number of encoder lines * 5700
Precision 6)	---
Noise 6)	---
Operational conditions	
Ambient temperature during operation	--- 7)
Relative humidity during operation	--- 7)
Storage and transport conditions	
Storage temperature	-25 to +55 °C
Relative humidity during storage	5 to 95 %, non-condensing
Transport temperature	-25 to +70 °C
Relative humidity during transport	95 % at +40 °C

Table 51: Technical data - HIPERFACE plug-in module 8BAC0121 (cont.)

1) The 8BAC0121.000-1 is an encoder module. Up to two encoder modules can be connected. In this case, the encoder module in the first slot automatically serves as motor feedback for the first axis and the encoder module in the second slot serves as motor feedback for the second axis. The second slot can be used for other purposes when in single-axis operation.
2) The HIPERFACE encoder must be wired using a cable with a single shield.
3) An additional reserve of 40 mA is available for terminating resistors.
4) No sense lines are present because the supply voltage for the HIPERFACE encoder is permitted to lie between 7 and 12 V.
5) This value does not correspond to the encoder resolution that must be configured in Automation Studio (16384 * number of encoder lines).
6) In the field, this is limited by the encoder.
7) ACOPOSmulti plug-in modules can be used in an ACOPOSmulti inverter or power supply module; the corresponding values can be found in the technical data of the respective ACOPOSmulti inverter or power supply module.

14.3.1 Indications

The indicators (UP/DN LEDs) are located on the front of the ACOPOSmulti drive or power supply module where the plug-in module is installed.

The UP/DN LEDs are lit depending on the rotational direction and the speed of the connected encoder. [1)]

UP LED ... indicates when the encoder position changes in the positive direction.
DN LED ... indicates when the encoder position changes in the negative direction.

14.3.2 Firmware

The firmware is part of the operating system for the ACOPOSmulti drive system. The firmware is updated by updating the ACOPOSmulti operating system.

1) The count direction of the encoder can be configured in Automation Studio. However, changing the count direction in Automation Studio does not change the actual count direction of the encoder and therefore does not affect the UP/DN LEDs!

15. Resolver plug-in module 8BAC0122.000-1

15.1 General description

The Resolver plug-in module 8BAC0122.000-1 can be used in an ACOPOSmulti slot. The module contains a resolver interface for evaluating BRX resolvers.

The plug-in module handles the output from resolvers which are built into B&R servo motors or used as an encoder for external axes. This resolver delivers the absolute position over one revolution. Normally, the movement path is longer than one revolution. In this case, a reference switch must be used and a homing procedure carried out.

The encoder input signals are monitored. In this way, broken connections, shorted lines and encoder supply failure (reference signal) can be recognized.

During start-up, the AC122 module is automatically identified by the ACOPOSmulti operating system. Making automatic adjustments to the motor (resolution parameter) and reading the motor parameters and limit values is not possible because the resolver does not have parameter memory like the EnDat encoder.

If the precision, resolution, bandwidth or ease of setting parameters is not sufficient with the resolver, the EnDat system should be used (see).

15.2 Order data

Model number	Short description	Image
8BAC0122.000-1	ACOPOSmulti plug-in module, resolver interface	

Table 52: Order data - resolver plug-in module 8BAC0122

Optional accessories				
Model number	**Amount**	**Short description**	**Comment**	**Page**
8CR005.12-1	1	Resolver cable, length 5m, 3 x 2 x 24 AWG/19, resolver plug 12-pin Intercontec socket, servo plug 9-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	87
8CR007.12-1	1	Resolver cable, length 7m, 3 x 2 x 24 AWG/19, resolver plug 12-pin Intercontec socket, servo plug 9-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	87
8CR010.12-1	1	Resolver cable, length 10m, 3 x 2 x 24 AWG/19, resolver plug 12-pin Intercontec socket, servo plug 9-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	87
8CR015.12-1	1	Resolver cable, length 15m, 3 x 2 x 24 AWG/19, resolver plug 12-pin Intercontec socket, servo plug 9-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	87
8CR020.12-1	1	Resolver cable, length 20m, 3 x 2 x 24 AWG/19, resolver plug 12-pin Intercontec socket, servo plug 9-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	87
8CR025.12-1	1	Resolver cable, length 25m, 3 x 2 x 24 AWG/19, resolver plug 12-pin Intercontec socket, servo plug 9-pin DSUB plug, can be used in cable drag chains, UL/CSA listed	---	87

Table 53: Optional accessory for resolver plug-in module 8BAC0122

15.3 Technical data

Product ID	8BAC0122.000-1
General information	
C-UL-US listed	In preparation
Module type	ACOPOSmulti plug-in module
Slot [1)]	Slots 1 and 2
Power consumption	In preparation
Encoder connection [2)]	
Connection, module-side	9-pin DSUB socket
Indicators	UP/DN LEDs
Electrical isolation Encoder - ACOPOSmulti	No
Encoder monitoring	Yes
Max. encoder cable length	100 m

Table 54: Technical data - resolver plug-in module 8BAC0122

Product ID	8BAC0122.000-1
Encoder supply	
Signal transfer	Differential signals
Frequency	10 kHz
Output voltage	Typ. 3 V_{eff}
Output current	Max. 50 mA_{eff}
Protective measures Overload protection Short circuit protection	 Yes Yes
Analog inputs	
Signal transfer	Differential signals
Input voltage	Resolver transfer: 0,5 ±10 %
Input Impedance	10.4 kΩ - j 11.1 kΩ
Common mode voltage	Max. ±20 V
ADC resolution	14-bit
Position	
Resolution @ ü = 0.5	Number of pole pairs * 22600
Bandwidth	In preparation
Accuracy	In preparation
Noise	In preparation
Operational conditions	
Ambient temperature during operation	--- 3)
Relative humidity during operation	--- 3)
Storage and transport conditions	
Storage temperature	-25 to +55 °C
Relative humidity during storage	5 to 95 %, non-condensing
Transport temperature	-25 to +70 °C
Relative humidity during transport	95 % at +40 °C

Table 54: Technical data - resolver plug-in module 8BAC0122 (cont.)

1) The 8BAC0122.000-1 is an encoder module. Two encoder modules can also be inserted. In this case, the encoder module in the first slot automatically serves as motor feedback for the first axis and the encoder module in the second slot serves as motor feedback for the second axis. The second slot can be used for other purposes when in single-axis operation.
2) The resolver must be wired using a cable with a single shield and twisted pair signal lines.
3) ACOPOSmulti plug-in modules can be used in an ACOPOSmulti inverter or power supply module; the corresponding values can be found in the technical data of the respective ACOPOSmulti inverter or power supply module.

15.3.1 Indications

The indicators (UP/DN LEDs) are located on the front of the ACOPOSmulti drive or power supply module where the plug-in module is installed.

The UP/DN LEDs are lit depending on the rotational direction and the speed of the connected encoder. 1)

UP LED ... indicates when the encoder position changes in the positive direction.
DN LED ... indicates when the encoder position changes in the negative direction.

15.3.2 Firmware

The firmware is part of the operating system for the ACOPOSmulti drive system. The firmware is updated by updating the ACOPOSmulti operating system.

1) The count direction of the encoder can be configured in Automation Studio. However, changing the count direction in Automation Studio does not change the actual count direction of the encoder and therefore does not affect the UP/DN LEDs!

16. SinCos plug-in module 8BAC0124.000-1

16.1 General description

The SinCos plug-in module 8BAC0124.000-1 can be used in an ACOPOSmulti slot. The module contains one interface for evaluating incremental encoders a with sinusoidal output signal. Limit switches can be connected.

The input signals are monitored. In this way, broken connections, shorted lines and encoder supply failure can be recognized. The encoder power supply has overload and short-circuit protection.

16.2 Order data

Model number	Short description	Image
8BAC0124.000-1	ACOPOSmulti plug-in module, SinCos interface	

Table 55: Order data - SinCos plug-in module 8BAC0124

16.3 Technical data

Product ID	8BAC0124.000-1
General information	
C-UL-US listed	In preparation
Module type	ACOPOSmulti plug-in module
Slot [1)]	Slots 1 and 2
Power consumption	In preparation

Table 56: Technical data - SinCos plug-in module 8BAC0124

Product ID	8BAC0124.000-1
Encoder connection [2)]	
Connection, module-side	15-pin DSUB socket
Indicators	UP/DN LEDs
Electrical isolation Encoder - ACOPOSmulti	 No
Encoder monitoring	Yes
Max. encoder cable length	75 m
Encoder supply	
Output voltage	5 V ± 5%
Load capacity	300 mA[3)]
Sense lines	2, compensation of max. 2 x 0.7 V
Protective measures Overload protection Short circuit protection	 Yes Yes
Sine-cosine inputs	
Signal transfer	Differential signals, symmetric
Differential voltage	0.5 to 1.25 V_{ss}
Common mode voltage	Max. ±7 V
Terminating resistors	120 Ω
Signal frequency (-5 dB)	DC up to 400 kHz
Signal frequency (-3 dB)	DC up to 300 kHz
ADC resolution	12-bit
Reference input	
Signal transfer	Differential signal, symmetric
Differential voltage for high	≥ +0.2 V
Differential voltage for low	≤ -0.2 V
Common mode voltage	Max. ±7 V
Terminating resistors	120 Ω
Position	
Resolution @ 1 V_{SS} [4)]	Number of encoder lines * 5700
Precision [5)]	---
Noise [5)]	---

Table 56: Technical data - SinCos plug-in module 8BAC0124 (cont.)

Product ID	8BAC0124.000-1
Limit switch inputs [6]	
Number of inputs	2
Wiring	Source
Input resistance	1470 Ω
Electrical isolation Input - ACOPOSmulti Input - Input	 No No
Input voltage Minimum Rated Maximum	 -12 V +5 V +20 V
Switching threshold LOW HIGH	 <0.8 V >2 V
Switching delay	Max. 100µs
Operational conditions	
Ambient temperature during operation	--- [7]
Relative humidity during operation	--- [7]
Storage and transport conditions	
Storage temperature	-25 to +55 °C
Relative humidity during storage	5 to 95 %, non-condensing
Transport temperature	-25 to +70 °C
Relative humidity during transport	95 % at +40 °C

Table 56: Technical data - SinCos plug-in module 8BAC0124 (cont.)

1) The 8BAC0124.000-1 is an encoder module. Up to two encoder modules can be connected. In this case, the encoder module in the first slot automatically serves as motor feedback for the first axis and the encoder module in the second slot serves as motor feedback for the second axis. The second slot can be used for other purposes when in single-axis operation.
2) The encoder must be wired using a cable with a single shield and twisted pair signal lines.
3) An additional reserve of 12 mA is available for terminating resistors and limit switch inputs.
4) This value does not correspond to the encoder resolution that must be configured in Automation Studio (16384 * number of encoder lines).
5) In the field, this is limited by the encoder.
6) The measurement system offered by Heidenhain with limit switch outputs LIDA 47x, LIDA 48x and LIF4x1 was tested for compatibility. In the field, the cable length is limited by the encoder.
7) ACOPOSmulti plug-in modules can be used in an ACOPOSmulti inverter or power supply module; the corresponding values can be found in the technical data of the respective ACOPOSmulti inverter or power supply module.

16.3.1 Indications

The indicators (UP/DN LEDs) are located on the front of the ACOPOSmulti drive or power supply module where the plug-in module is installed.

The UP/DN LEDs are lit depending on the rotational direction and the speed of the connected encoder. 1)

UP LED ... indicates when the encoder position changes in the positive direction.
DN LED ... indicates when the encoder position changes in the negative direction.

16.3.2 Firmware

The firmware is part of the operating system for the ACOPOSmulti drive system. The firmware is updated by updating the ACOPOSmulti operating system.

1) The count direction of the encoder can be configured in Automation Studio. However, changing the count direction in Automation Studio does not change the actual count direction of the encoder and therefore does not affect the UP/DN LEDs!

Chapter 3 • Installation

1. General information

1.1 Mounting ACOPOSmulti modules

The following points must be taken into consideration when installing modules on mounting plates:

- Attach the module to the mounting plate using the mounting clip(s) on the top:

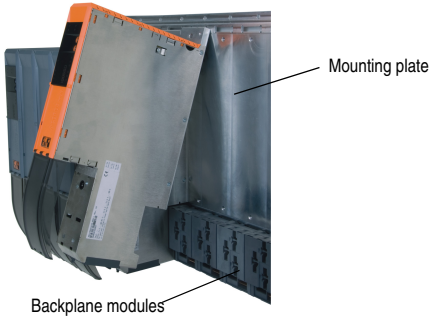


Figure 1: Attaching modules

- Clip the module onto the backplane module(s).
  The module must be thoroughly attached, so that it rests straight in the backplane module(s) in order for the module contacts to function properly.
- Tighten M6 screws (2 per module width) on the module, with a **torque of max. 5 Nm**:

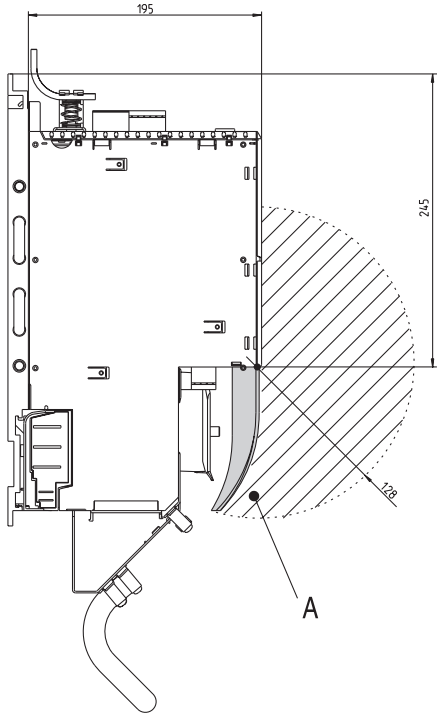
Figure 2: Tightening the fasting screws

2. Dimension diagrams and installation dimensions

2.1 General information

2.1.1 Swivel range of the connector cover

Keep the swivel range of the connector cover(s) on the front side of the ACOPOSmulti modules free when installed to prevent cabling problems with ACOPOSmulti modules:



A ... Swivel range of the connector cover

Figure 3: Swivel range of the connector cover

2.2 Line filter

2.2.1 8BVF0440H000.001-1

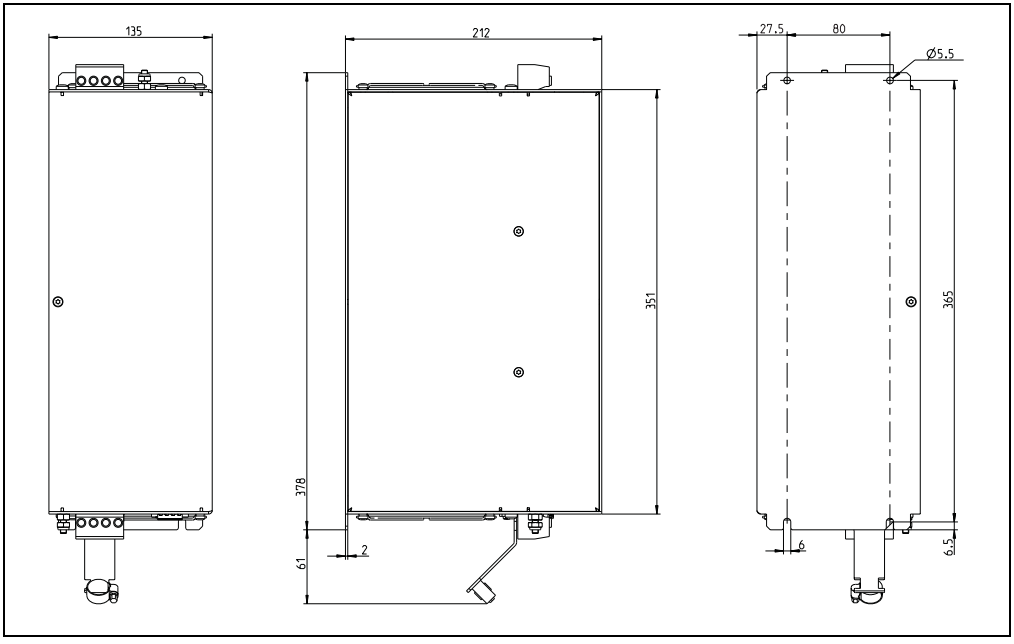


Figure 4: Dimensional diagram and installation dimensions for 8BVF0440H000.001-1

2.2.2 8BVF0880H000.000-1

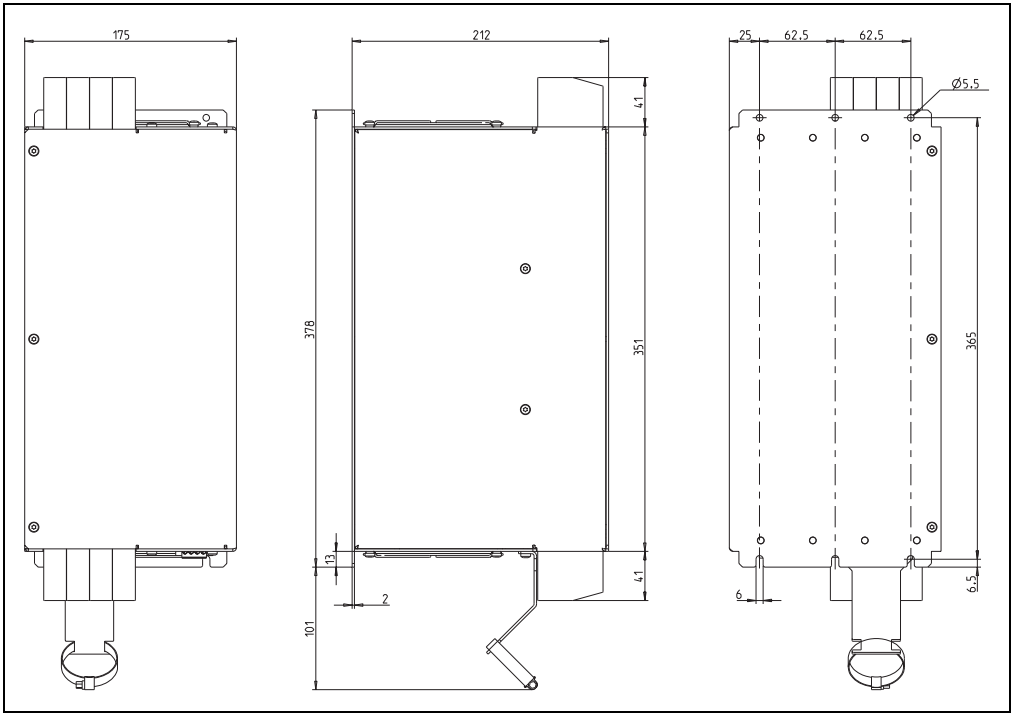


Figure 5: Dimensional diagram and installation dimensions for 8BVF8800H000.000-1

2.3 Regeneration chokes

2.3.1 8BVR0440H000.100-1

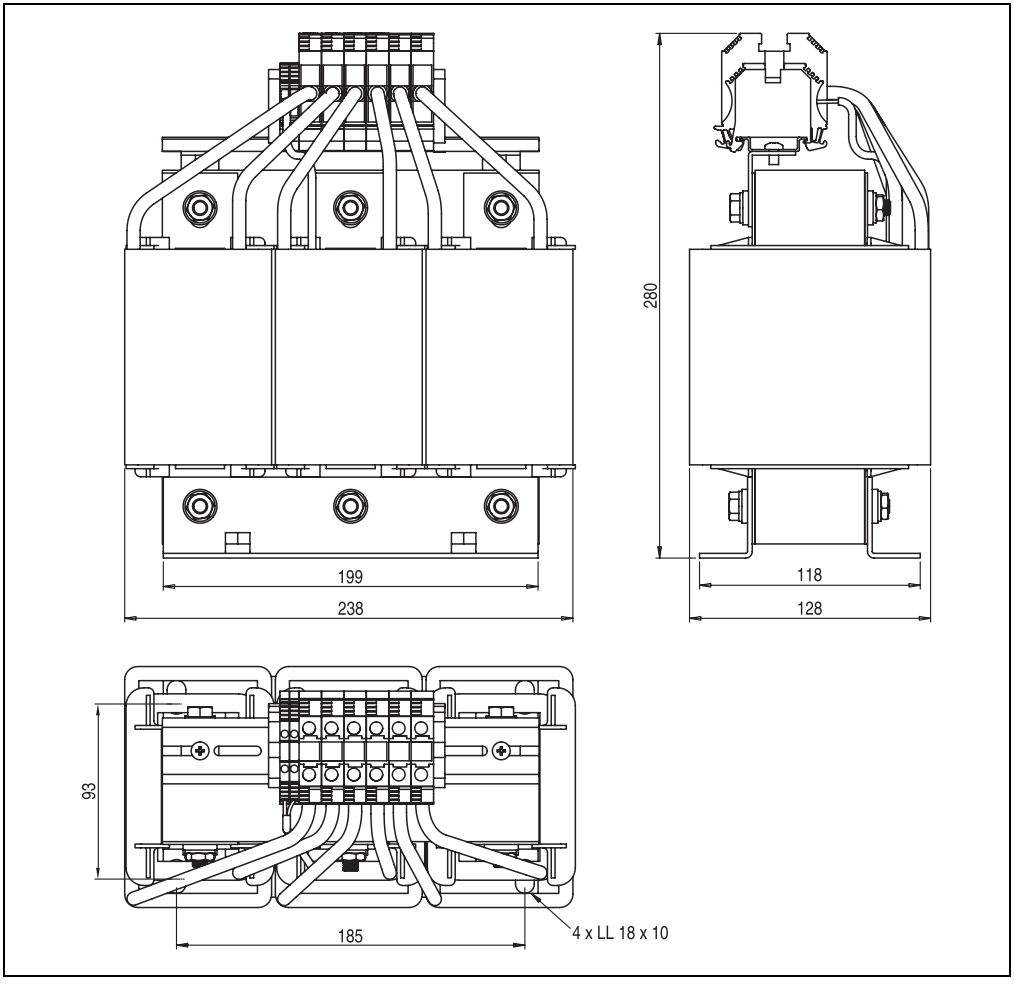


Figure 6: Dimensional diagram and installation dimensions for 8BVR0440H000.100-1

2.3.2 8BVR0880H000.100-1

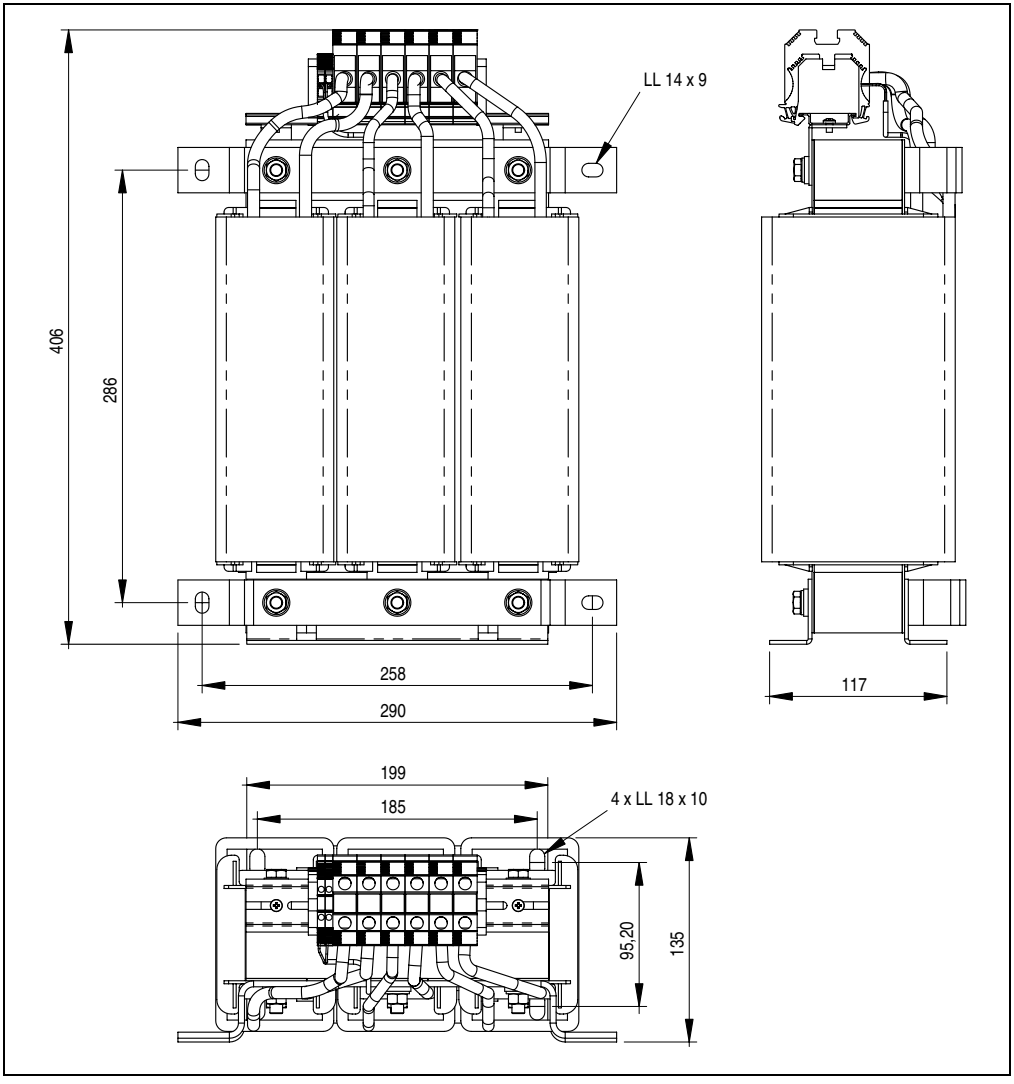


Figure 7: Dimensional diagram and installation dimensions for 8BVR0880H000.100-1

2.4 Wall mounting

2.4.1 Mounting plate 8B0MnnnnHW00.000-1 [1)]

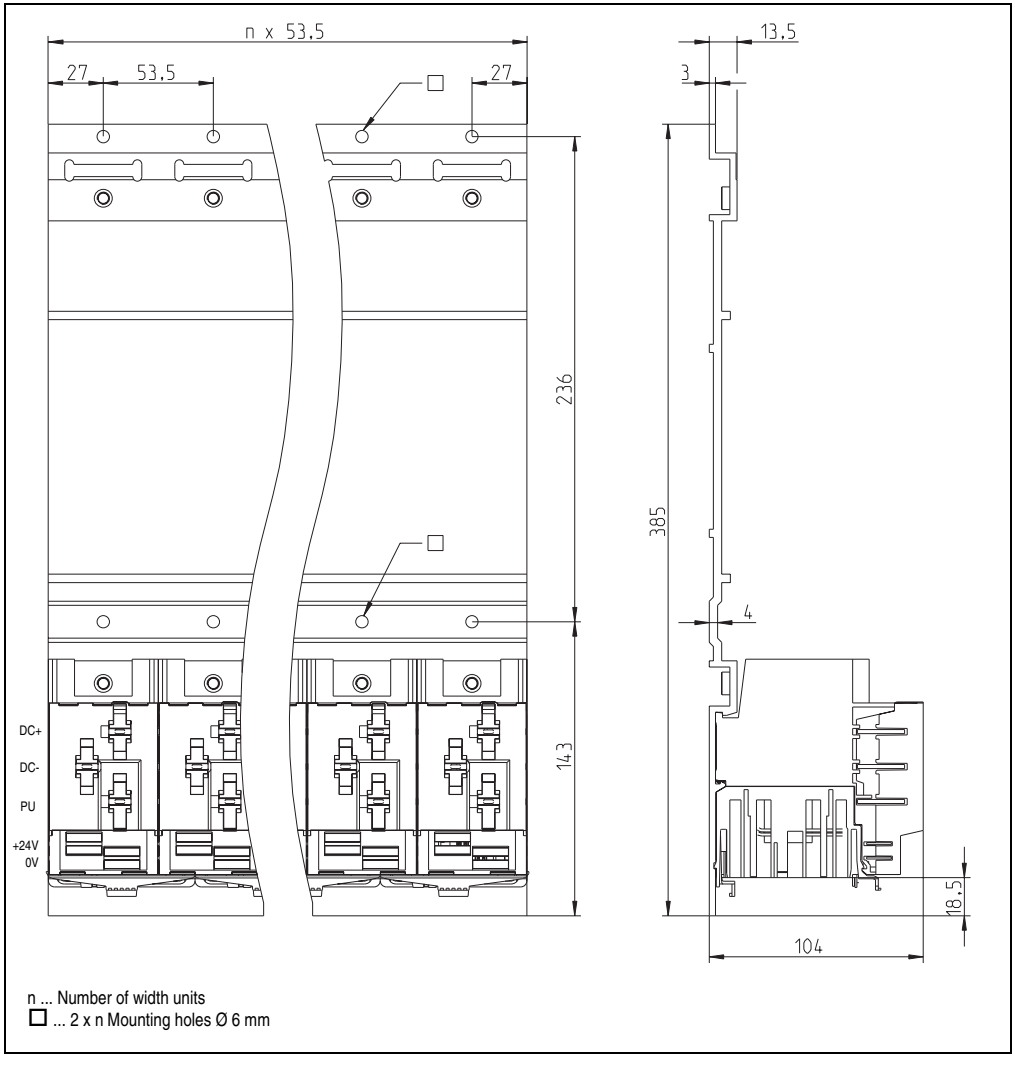
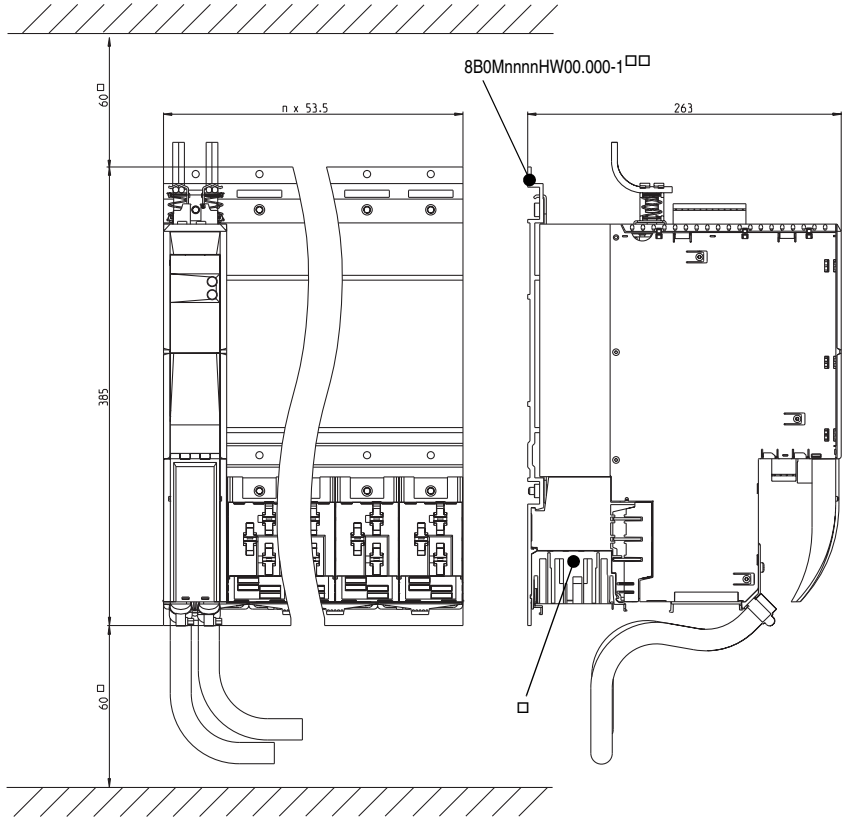


Figure 8: Dimensional diagram and installation dimensions for 8B0MnnnnHW00.000-1

1) nnnn indicates the number of slots (0160 equals 16 slots).

2.4.2 Inverter module 8BVI0055HWD0.000-1



□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
To ensure that the fan modules in the mounting plate can be exchanged easily, at least 250 mm has to be left free below the module.

□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 9: Dimensional diagram and installation dimensions for 8BVI0055HWD0.000-1

2.5 Cold plate mounting

2.5.1 Mounting plate 8B0MnnnnHC00.000-1 [1)]

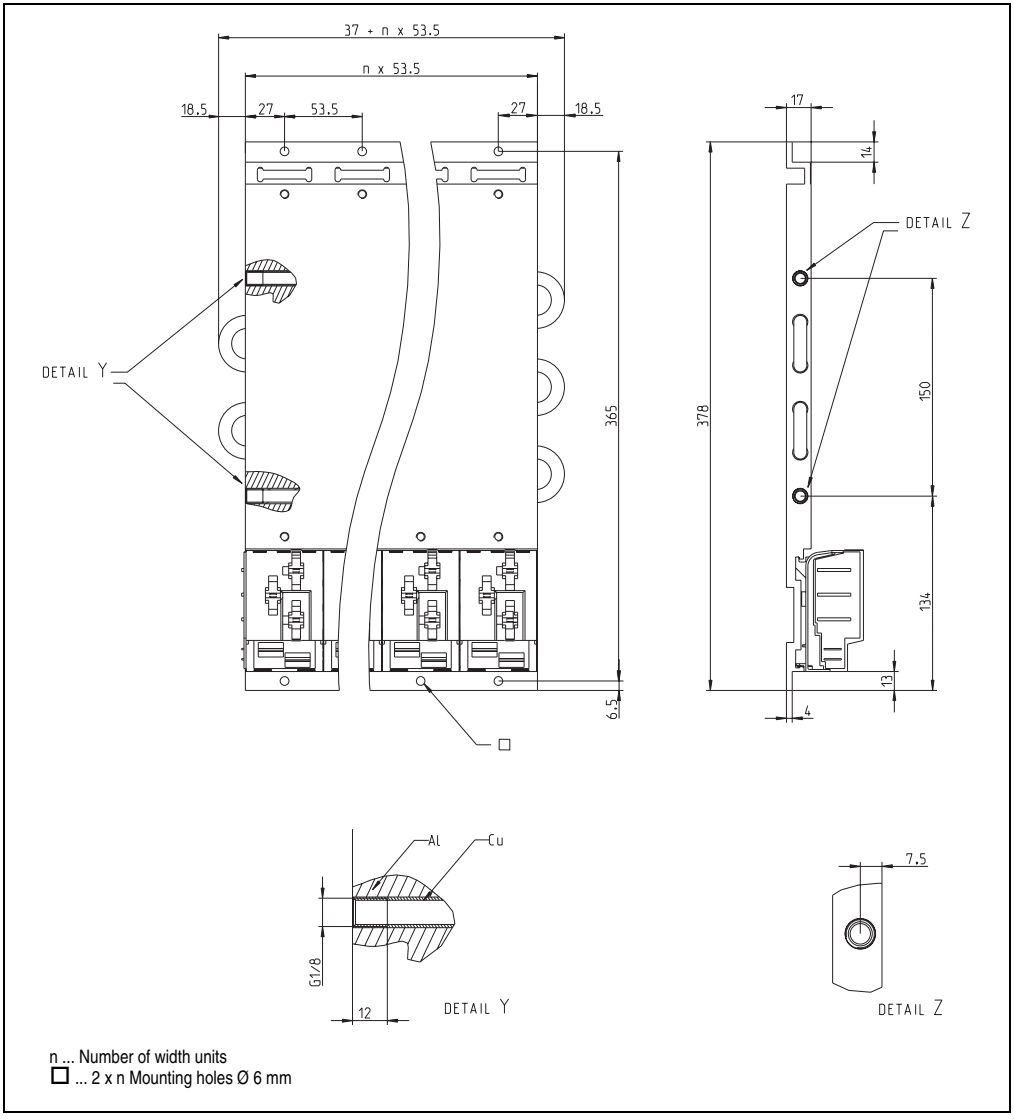


Figure 10: Dimension diagram and installation dimensions 8B0MnnnnHC00.000-1

1) nnnn indicates the number of slots (0160 equals 16 slots).

2.5.2 Power supply module 8BVP0880HC00.000-1

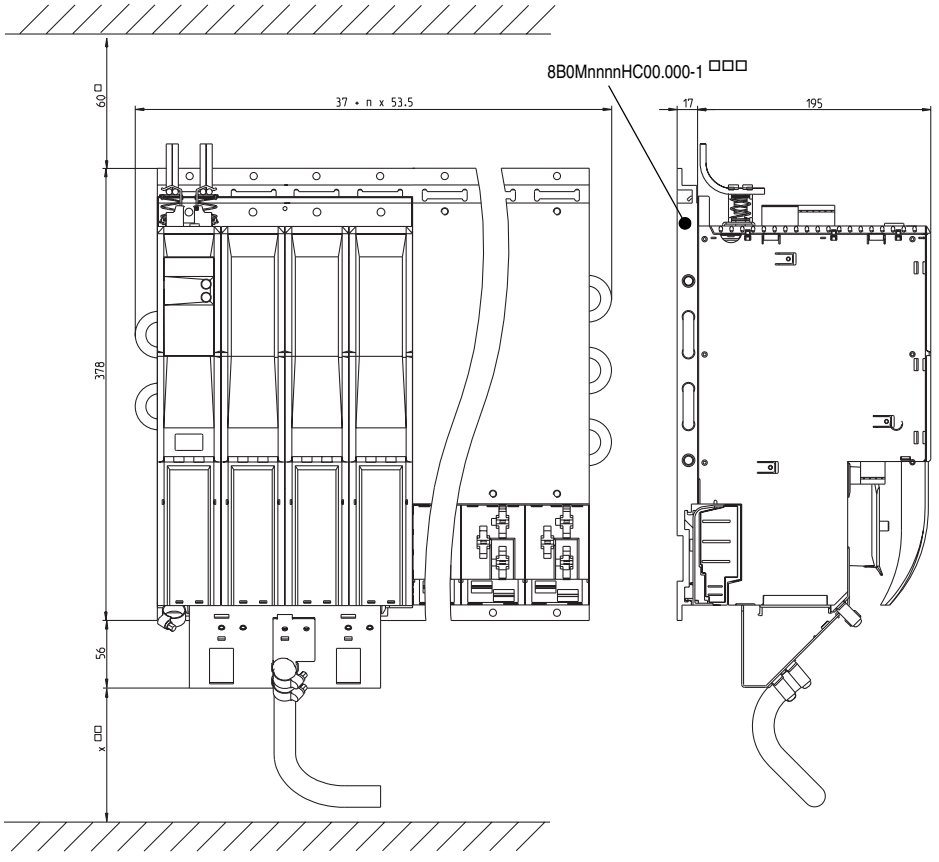

8B0MnnnnHC00.000-1 □□□
60□
37 • n x 53.5
17
195
378
56
x □□
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... The required spacing x to the wiring on the bottom of the module depends on the power cable being used.
□□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 11: Dimensional diagram and installation dimensions for 8BVP0880HC00.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.5.3 Auxiliary supply module 8B0C0160HC00.000-1

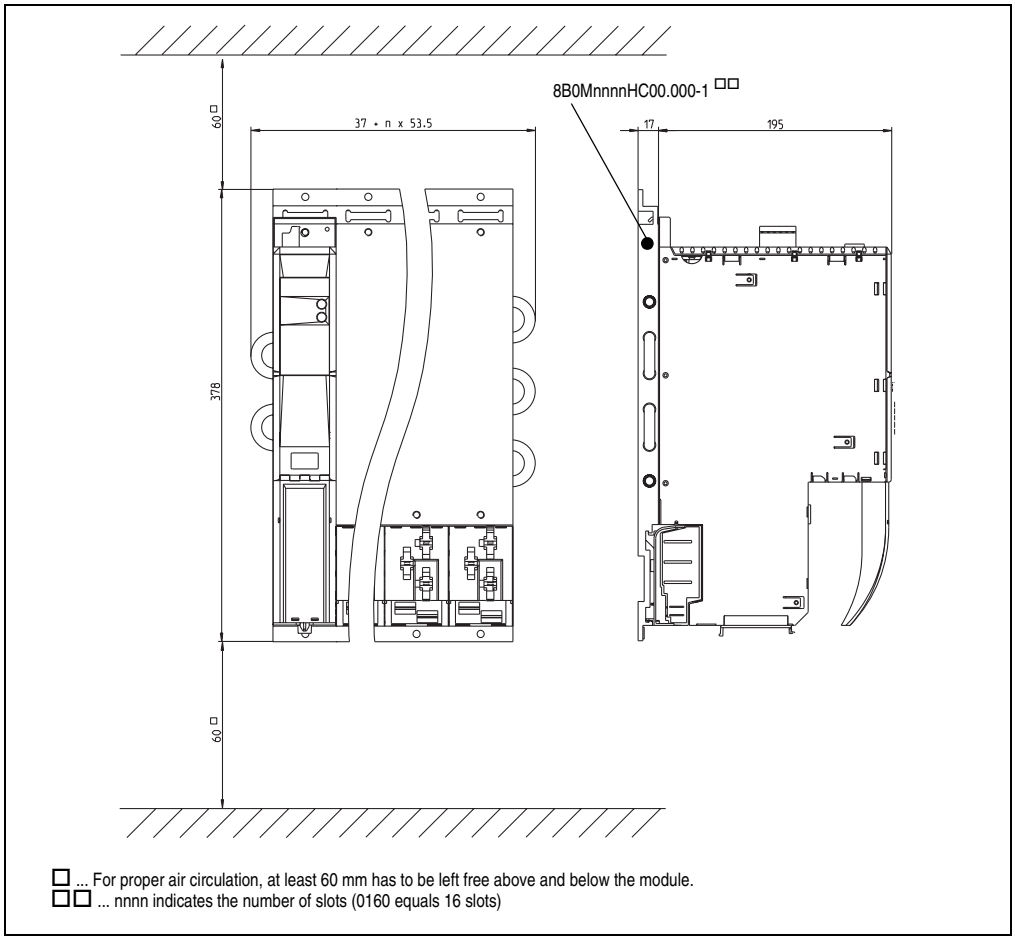

8B0MnnnnHC00.000-1 □□
37 • n x 53.5
17
195
60 □
378
60 □
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 12: Dimensional diagram and installation dimensions for 8B0C0160HC00.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.5.4 Auxiliary supply module 8B0C0160HC00.001-1

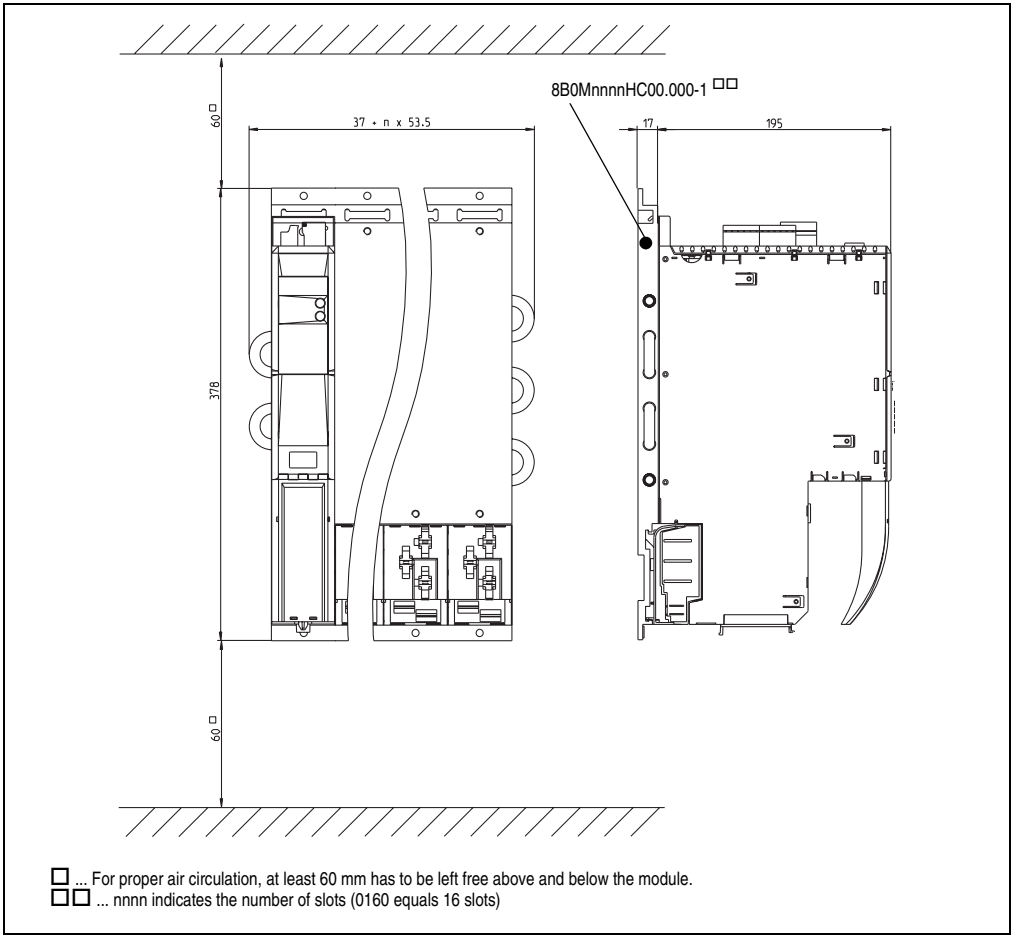

8B0MnnnnHC00.000-1 □□
60 □
37 + n x 53.5
17
195
378
60 □
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 13: Dimensional diagram and installation dimensions for 8B0C0160HC00.001-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.5.5 Inverter module 8BVI0055HCS0.000-1

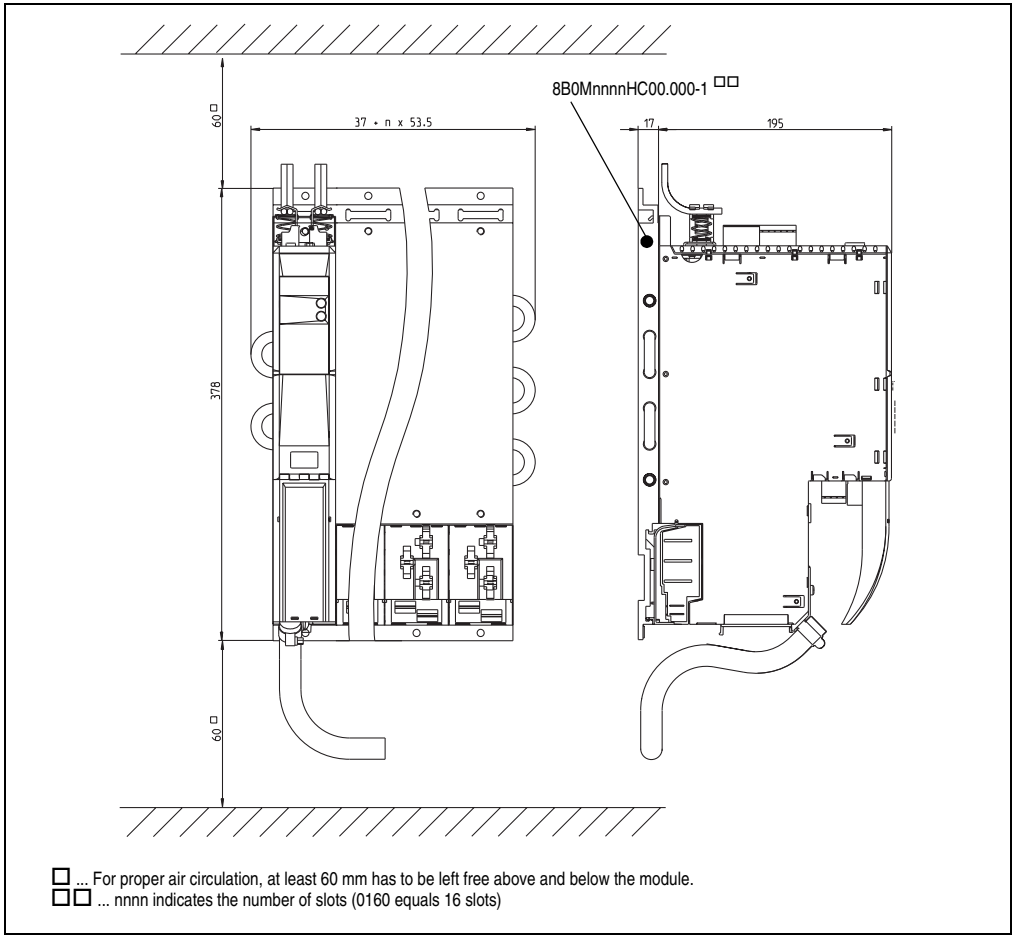

8B0MnnnnHC00.000-1 □□
37 • n x 53.5
17
195
60 □
378
60 □
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

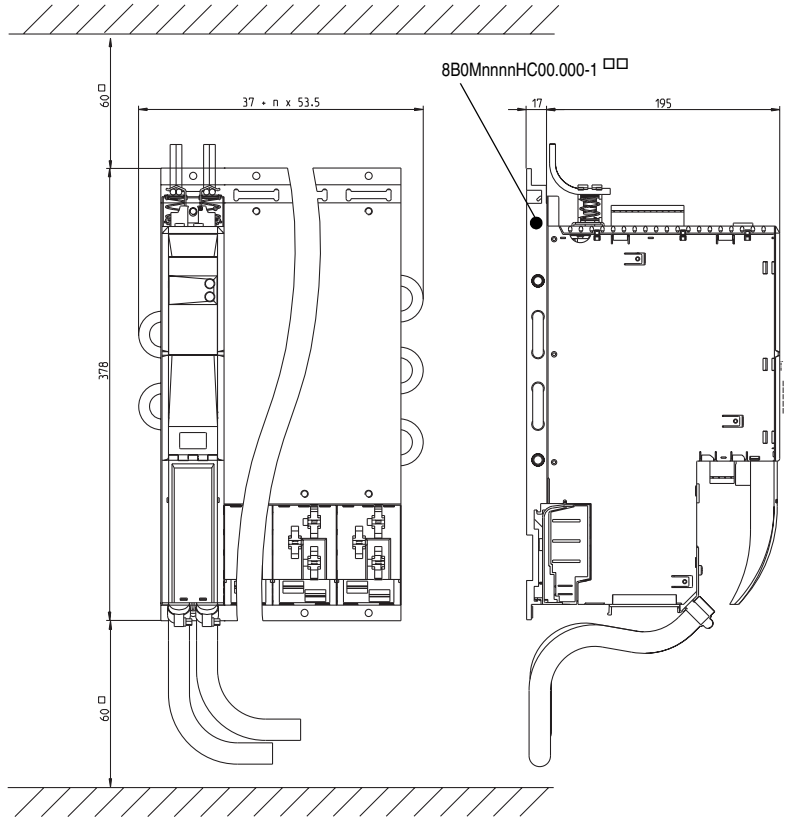
Figure 14: Dimensional diagram and installation dimensions for 8BVI0055HCS0.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.5.6 Inverter module 8BVI0055HCD0.000-1



□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 15: Dimensional diagram and installation dimensions for 8BVI0055HCD0.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.5.7 Inverter module 8BVI0880HC00.000-1

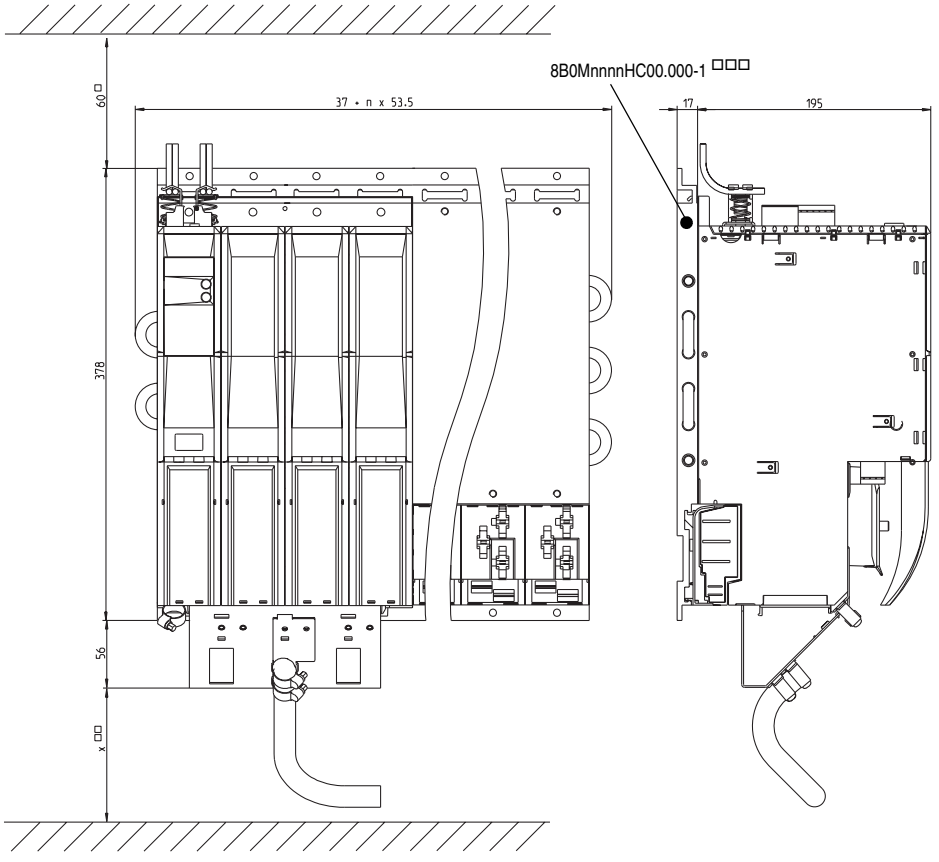

8B0MnnnnHC00.000-1 □□□
60□
37 • n x 53.5
17
195
378
56
x □□
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... The required spacing x to the wiring on the bottom of the module depends on the motor cable being used.
□□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 16: Dimensional diagram and installation dimensions for 8BVI0880HC00.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.6 Feed-through mounting

2.6.1 Mounting plate 8B0MnnnnHF00.000-1 [1)]

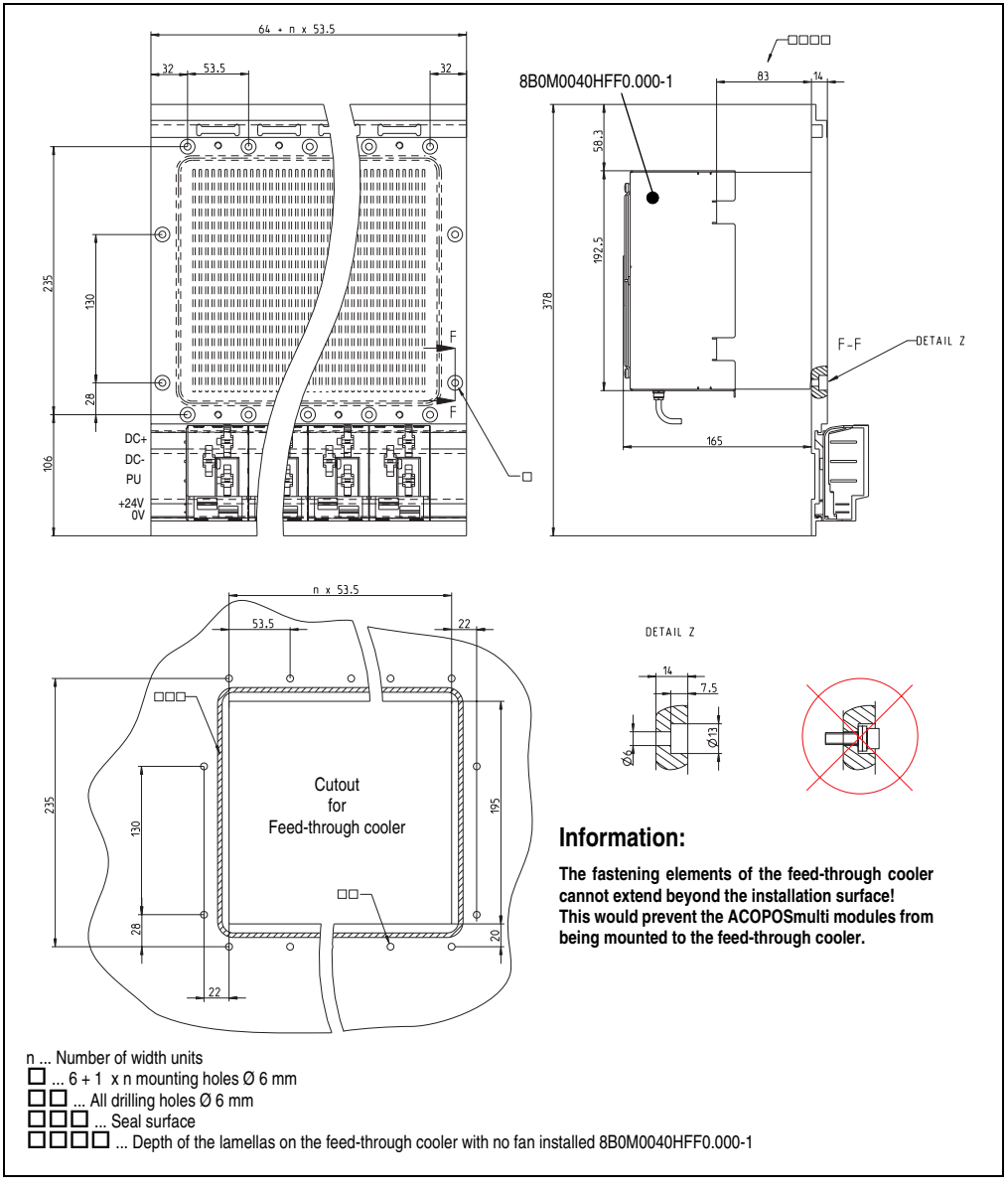
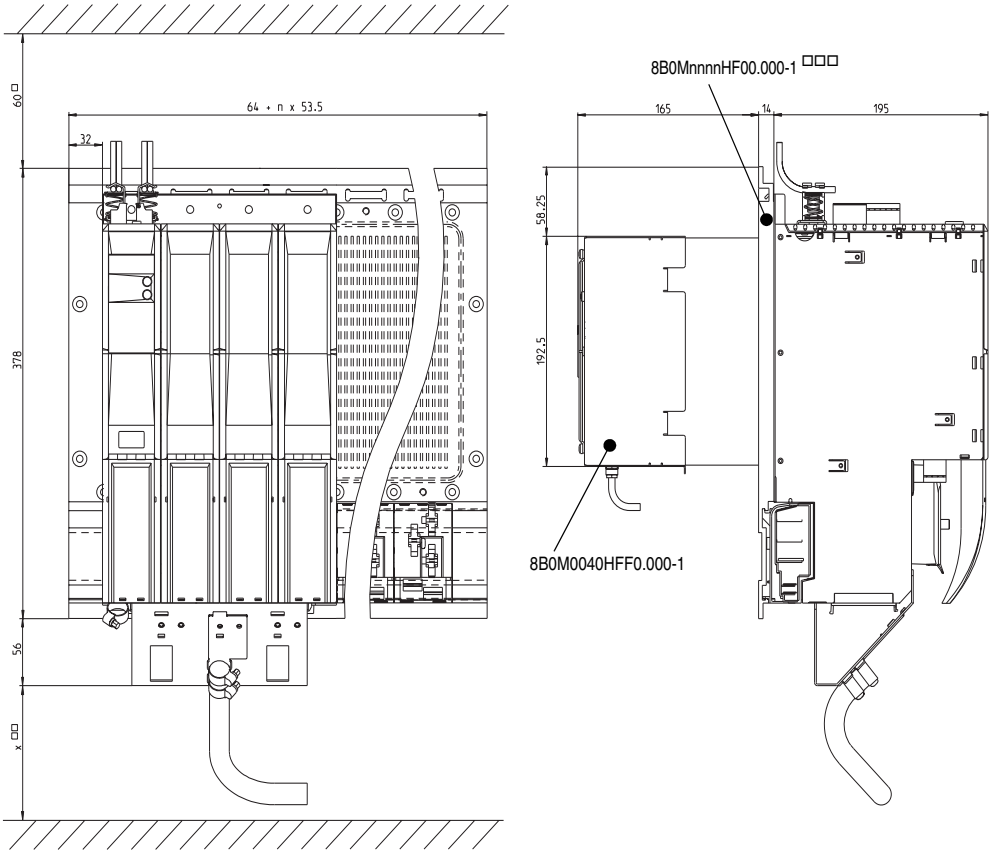


Figure 17: Dimensional diagram and installation dimensions for 8B0MnnnnHF00.000-1

1) nnnn indicates the number of slots (0160 equals 16 slots).

2.6.2 Power supply module 8BVP0880HC00.000-1



n ... Number of width units (for 8BVP0880HC00.000-1: n = 4)
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... The required spacing to the wiring on the bottom of the module depends on the power cable being used.
□□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 18: Dimensional diagram and installation dimensions for 8BVP0880HC00.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.6.3 Auxiliary supply module 8B0C0160HC00.000-1

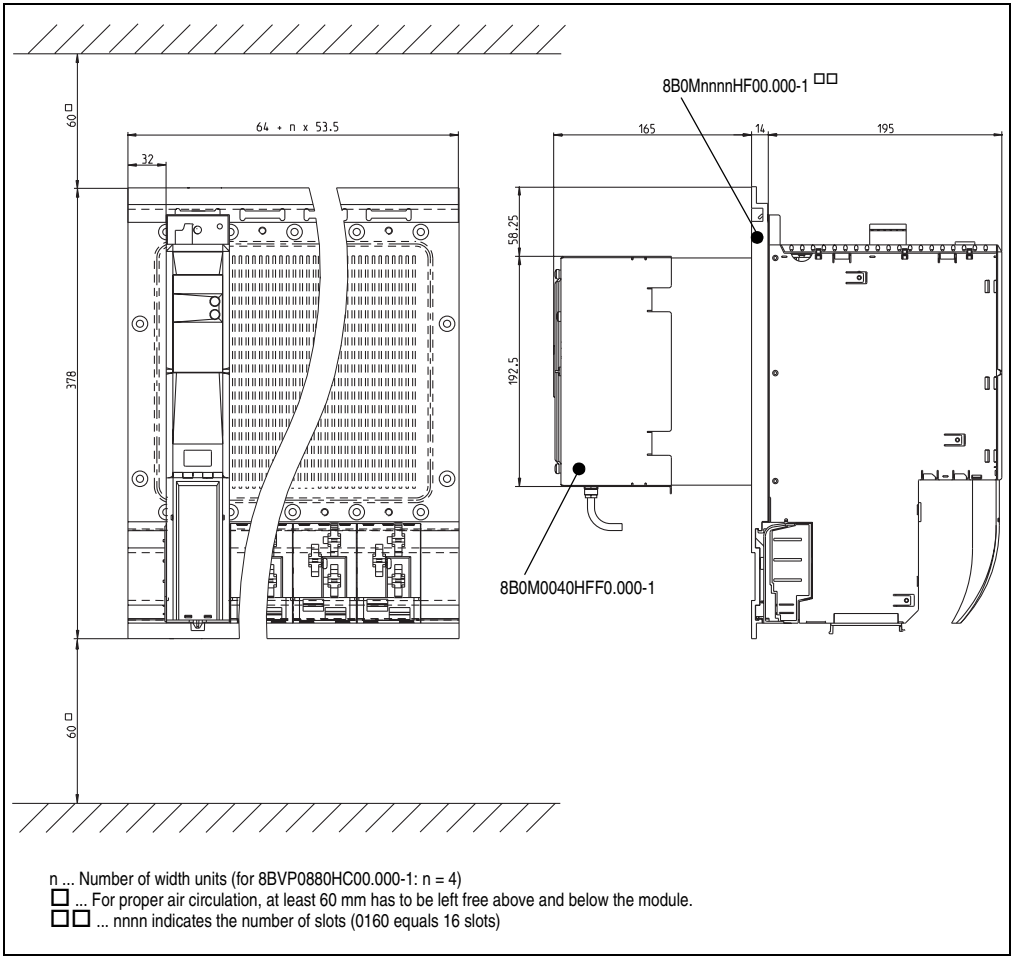

8B0MnnnnHF00.000-1 □□
60 □
64 + n x 53.5
32
165
14
195
58.25
192.5
378
60 □
8B0M0040HFF0.000-1
n ... Number of width units (for 8BVP0880HC00.000-1: n = 4)
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 19: Dimensional diagram and installation dimensions for 8B0C0160HC00.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.6.4 Inverter module 8BVI0055HCS0.000-1

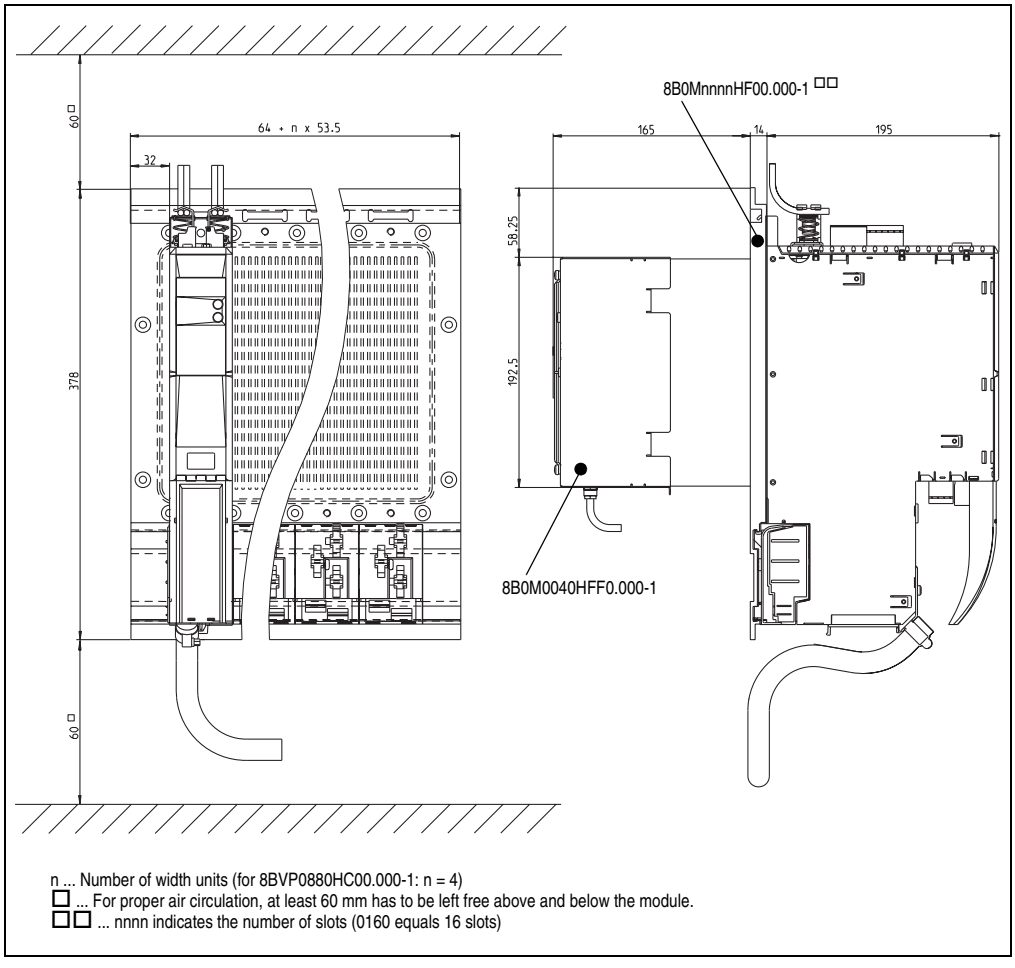

8B0MnnnnHF00.000-1 □□
64 + n x 53.5
32
165
14
195
60 □
378
60 □
58.25
192.5
8B0M0040HFF0.000-1
n ... Number of width units (for 8BVP0880HC00.000-1: n = 4)
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 20: Dimensional diagram and installation dimensions for 8BVI0055HCS0.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.6.5 Inverter module 8BVI0055HCD0.000-1

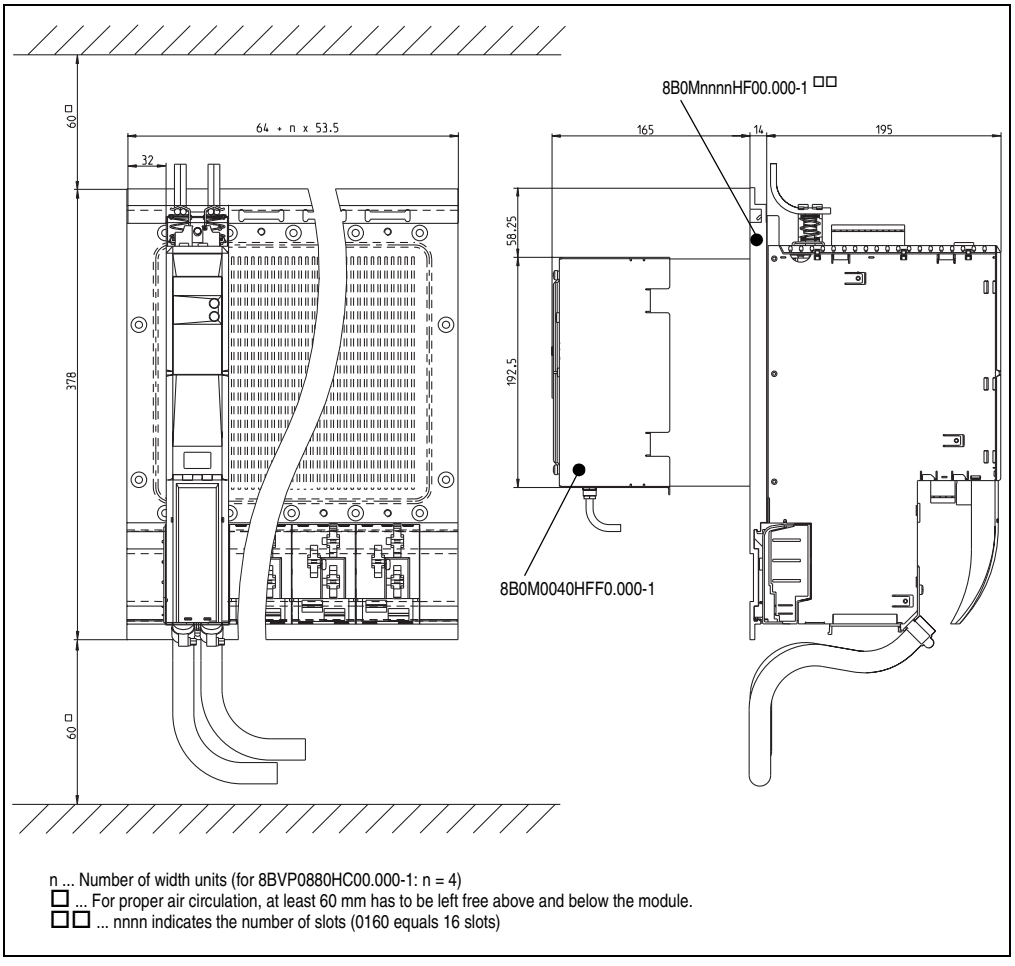

8B0MnnnnHF00.000-1 □□
60 □
64 + n x 53.5
32
165
14
195
58.25
192.5
378
8B0M0040HFF0.000-1
60 □
n ... Number of width units (for 8BVP0880HC00.000-1: n = 4)
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

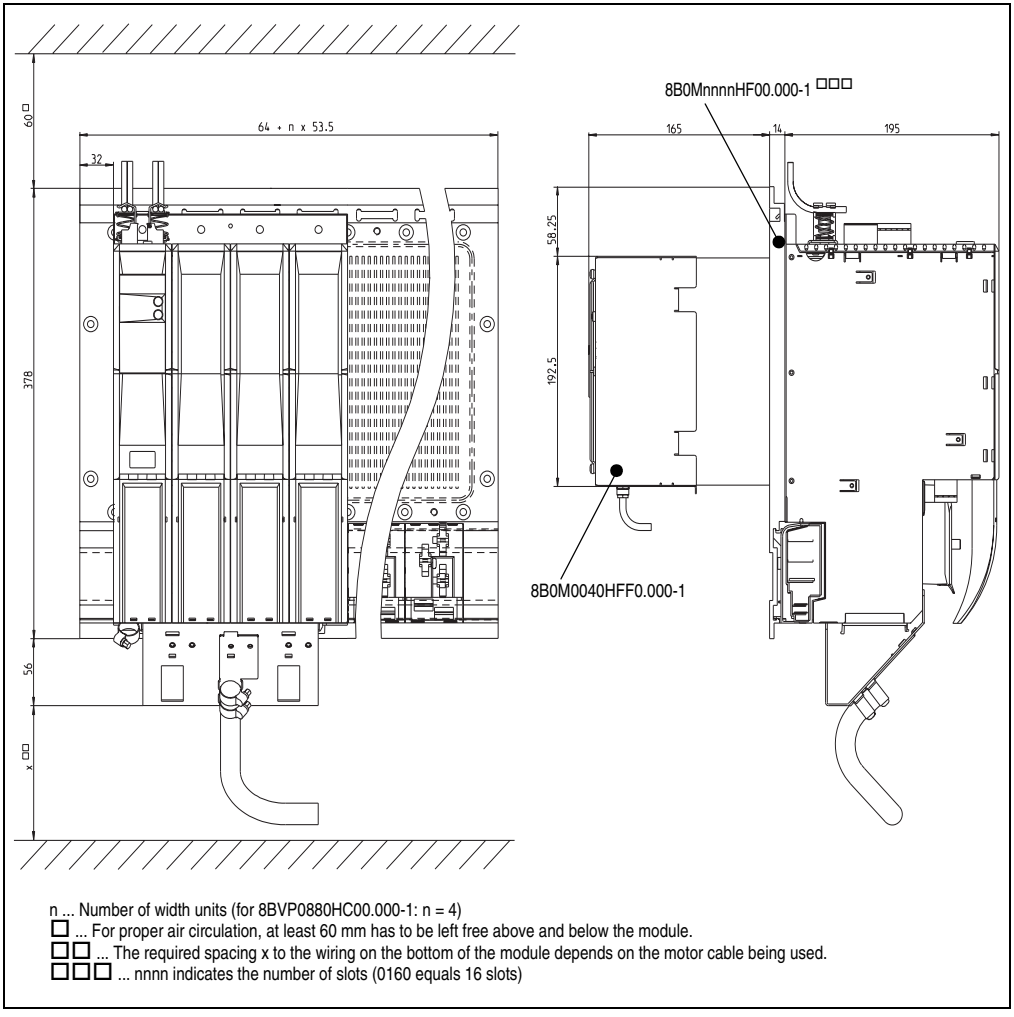
Figure 21: Dimensional diagram and installation dimensions for 8BVI0055HCD0.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

2.6.6 Inverter module 8BVI0880HC00.000-1



n ... Number of width units (for 8BVP0880HC00.000-1: n = 4)
□ ... For proper air circulation, at least 60 mm has to be left free above and below the module.
□□ ... The required spacing x to the wiring on the bottom of the module depends on the motor cable being used.
□□□ ... nnnn indicates the number of slots (0160 equals 16 slots)

Figure 22: Dimensional diagram and installation dimensions for 8BVI0880HC00.000-1

Information:

When mounting ACOPOSmulti modules for cold-plate or feed-through mounting, be sure not to scratch the backplane. This can impair thermal dissipation to the mounting plate.

Do not place ACOPOSmulti modules for cold-plate or feed-through mounting on the bottom side. This would create the risk of breaking the clips that hold the unit's fan. Following this recommendation can prevent having to replace the fans later on.

Chapter 4 • Dimensioning

1. Power mains connection

1.1 General information

1.1.1 System configuration

The power mains connection for the ACOPOSmulti drive system is made using terminals X1 / L1, L2, L3 and PE on the ACOPOSmulti line filter. The ACOPOSmulti drive system can be directly connected to TT and TN systems (these are three-phase systems with grounded neutral).

When using ungrounded IT mains (three-phase systems without grounded neutral) or TN-S mains with grounded phase conductor and protective ground conductor, isolation transformers must be used. The secondary neutral must be grounded and connected to the ACOPOSmulti drive system protective ground conductor. In this way, it is possible to prevent over-voltages between external conductors and the housing for the ACOPOSmulti modules. Three-phase isolation transformers with the corresponding input and output voltages and a vector group with secondary neutral can be used (e. g. 3 x 400 V / 3 x 400 V, Dyn5).

Danger!

ACOPOSmulti drive systems are only permitted to be operated directly on grounded, three-phase industrial mains (TT, TN-S, TN-C-S). When using the ACOPOSmulti drive system in living areas, shops and small businesses, additional filtering measures must be implemented by the user.

Danger!

ACOPOSmulti drive systems are not permitted to be operated directly on IT and TN-S mains with a grounded phase conductor and protective ground conductor!

Warning!

ACOPOSmulti drive systems are suitable for power mains which can provide a maximum short circuit current (SCCR) of 10000 A_{eff} at a maximum of 528 V_{eff}.

Warning!

The network's short-circuit capacity Sk must be 10 times greater than the continuous power of the selected power supply unit.

1.1.2 Supply voltage range

The permissible supply voltage range for ACOPOSmulti drive systems is 3 x 220 VAC to 480 VAC ±10%.

Respective intermediate transformers must be used for other supply voltages. With grounded power mains, autotransformers can also be used to adjust the voltage. Neutral does not have to be connected for this type of transformer.

1.1.3 Protective Ground Connection (PE)

The following information concerning the protective ground connection corresponds to IEC 61800-5, Item 3.2.5.3 "Connection elements for the protective ground conductor" and must be followed.

A protective ground conductor must be connected to the line filter and also the ACOPOSmulti power supply module.

Wire cross section

The wire cross section for the protective ground conductor is oriented to the external conductors and must be selected according to the following table:

Wire cross section for external line A [mm²]	Minimum wire cross section for protective ground connection A_{PE} [mm²]
A ≤ 16	A
16 < A ≤ 35	16
35 <A	A / 2

Table 57: Selection of the protective ground conductor cross section

Increased Discharge Current

Danger!

ACOPOSmulti drive systems are devices with increased discharge current (larger than 3.5 mA AC or 10 mA DC).

A permanent (immoble) protective ground connection must be provided for ACOPOSmulti line filter / power supply units. The following conditions must be met, depending on the ACOPOSmulti module being used:

ACOPOSmulti module	Condition	Image
8BVF0110H000.000-1	In addition to the connection of the first protective ground conductor on terminal X1 / PE, a second protective ground conductor with the same cross section must be connected on the designated connector (threaded bolt M5).	
8BVF0440H000.001-2	In addition to the connection of the first protective ground conductor on terminal X1 / PE, a second protective ground conductor with the same cross section must be connected on the designated connector (threaded bolt M5).	
8BVF0880H000.000-1	The cross section of the protective ground conductor connected to terminal X1 / PE must be at least 10 mm² Cu.	

Table 58: Protective ground conditions for ACOPOSmulti line filter 8BVF

ACOPOSmulti module	Condition	Image
8BVP0110Hx00.000-1	In addition to the connection of the first protective ground conductor on terminal X5 / PE, a second protective ground conductor with the same cross section must be connected on the designated connector (threaded bolt M5).	
8BVP0440Hx00.000-11-2	In addition to the connection of the first protective ground conductor on terminal X5 / PE, a second protective ground conductor with the same cross section must be connected on the designated connector (threaded bolt M5).	
8BVP0880Hx00.000-1	The cross section of the protective ground conductor connected to terminal X5 / PE must be at least 10 mm^2 Cu.	

Table 59: Protective ground conditions for ACOPOSmulti power supply module 8BVP

1.2 Dimensioning

In general, dimensioning the power mains, the over-current protection and (if necessary) the line contactors depend on the structure of the power mains connection.

1.2.1 Design of the ACOPOSmulti power mains connections

The structure of a power mains connection with circuit breaker can be seen in the following diagram:

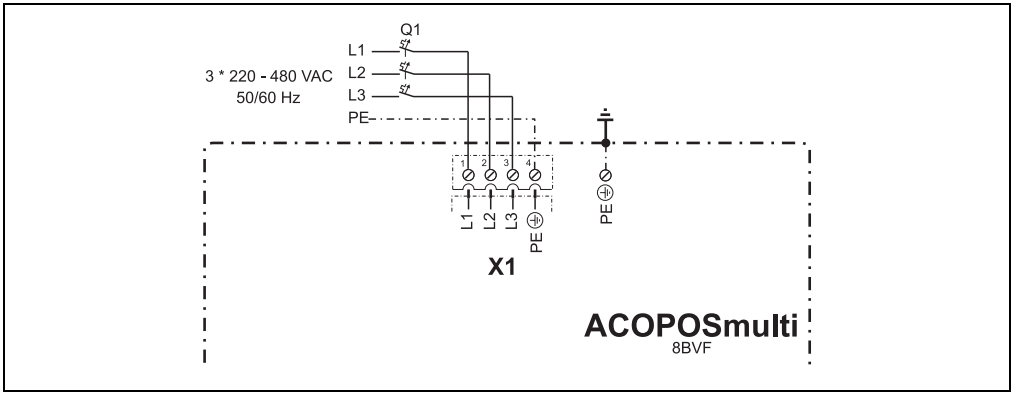


Figure 23: Circuit diagram for ACOPOSmulti line filter, power mains connection

Dimensioning the Power Mains and Over-current Protection

The cross section of the power mains and the rated current for over-current protection should be dimensioned for the average current load to be expected.

The average current load to be expected can be calculated as follows:

$$I_{Netz}[A] = \frac{P[VA]}{\sqrt{3} \cdot U_{Netz}[V]}$$

The cross section of the power mains and the rated current of the over-current protection used are chosen according to table 60 "Maximum current load for PVC insulated three-phase cables or individual wires" on page 122 so that the maximum current load for the cable cross section selected is greater than or equal to the calculated current load.

$$I_Z \geq I_{Netz}$$

The rated current of the over-current protection must be less than or equal to the maximum current load for the cable cross section selected (see table 60 "Maximum current load for PVC insulated three-phase cables or individual wires" on page 122).

$$I_B \leq I_Z$$

The following table shows the maximum current load of PVC insulated three-phase cables (or three current-carrying wires) according to IEC 60204-1 at 40 °C ambient temperature [1] and 70 °C maximum conductor temperature (maximum current load for installation type F and cross sections greater than 35 mm², IEC 60364-5-523 is used for installation types B1 and B2).

Line cross section [mm²]	Maximum current load for the cable cross section I_Z / rated current for the over-current protection I_R [A] depending on the type of installation				
	Three individual wires in insulating conduit or cable duct B1	Three-phase cable in insulating conduit or cable duct B2	Three-phase cable on walls C	Three-phase cable in a cable tray E	Three individual wires in a cable tray F
1,5	13,5 / 13	12,2 / 10	15,2 / 13	16,1 / 16	---
2,5	18,3 / 16	16,5 /16	21 / 20	22 / 20	---
4	25 / 25	23 / 20	28 / 25	30 / 25	---
6	32 / 32	29 / 25	36 / 32	37 / 32	---
10	44 / 32	40 / 32	50 / 50	52 / 50	---
16	60 / 50	53 / 50	66 / 63	70 / 63	---
25	77 / 63	67 / 63	84 / 80	88 / 80	96 / 80
35	97 / 80	83 / 80	104 / 100	114 / 100	119 / 100
50	117 / 100	103 / 100	123 / 100	123 / 100	145 / 125
70	149 / 125	130 / 125	155 / 125	155 / 125	188 / 160
95	180 / 160	156 / 125	192 / 160	192 / 160	230 / 200

Table 60: Maximum current load for PVC insulated three-phase cables or individual wires

When determining the cross section for the power mains, make sure that the cross section selected is within the range that can be used with power mains terminal X1 on the ACOPOSmulti line filter (see section 1.4 "Overview of the terminal cross sections" on page 167).

Over-current protection in the form of a circuit breaker or a fuse is required. Circuit breakers (time lag) with type C tripping characteristics (according to IEC 60898) or fuses (time lag) with type gG tripping characteristics (according to IEC 60269-1) are to be used. [2]

1) The maximum current load value in IEC 60204-1 is for an ambient temperature of 40 °C. In IEC 60364-5-523, this reference temperature is 30 °C. The values in table 60 "Maximum current load for PVC insulated three-phase cables or individual wires" on page 122 from IEC 60364-5-523 are calculated with the factor k_{Temp} = 0.87 given in the standard and also at 40 °C.
With the specified maximum current load, a reduction factor for groups of cables and individual wires is not taken into consideration. If necessary, they must be taken from the corresponding standards and included in the calculation.

2) Circuit breakers are available on the market with rated currents from 6 A to 63 A.
Outside of this range, fuses must be used.

North America:

Class J fuses according to UL Standard 248-8 can be used (for example fuses of type AJTxx from Gould Shawmut (www.gouldshawmut.com) or type LPJ-xxSP from Bussmann (www.bussmann.com), where xx is the rated current for the respective fuse).

The fuse must have the following tripping characteristics:

Minimum tripping time [s]	Rated current for the fuse at an average expected current load of			
	12 ... 35 A	50 ... 80 A	100 ... 125 A	160 A
0,2	Approx. 5.1 * I_{mains}	Approx. 4.5 * I_{mains}	Approx. 3.6 * I_{mains}	Approx. 4.0 * I_{mains}
4	Approx. 3.7 * I_{mains}	Approx. 3.3 * I_{mains}	Approx. 2.8 * I_{mains}	Approx. 3.2 * I_{mains}
10	Approx. 2.9 * I_{mains}	Approx. 2.5 * I_{mains}	Approx. 2.0 * I_{mains}	Approx. 2.3 * I_{mains}
240	Approx. 1.7 * I_{mains}	Approx. 1.7 * I_{mains}	Approx. 1.6 * I_{mains}	Approx. 1.8 * I_{mains}

Table 61: Tripping characteristics of the fuse for the power mains connection

Dimensioning the Line Contactor

The rated current of the line contactor is oriented to the over-current protection for the power mains connection. The line contactor is set up so that nominal operating current specified by the manufacturer of the line contactor for category AC-1 according to EN 60947-4-1 is approximately 1.3 times the rated current of the over-current protection.

1.3 Fault current protection

Fault current protection (RCD - residual current-operated protective device) can be used with ACOPOSmulti drive systems. However the following points must be noted:

ACOPOSmulti drive systems have a power rectifier. If a short-circuit to the frame occurs, a flat DC fault current can be created which prevents an AC current or pulse current sensitive RCD (Type A or AC) from being activated, therefore canceling the protective function for all connected devices.

Danger!

If used for protection during direct or indirect contact of the fault current protection (RCD), only a Type B RCD (AC-DC sensitive, according to IEC 60755) can be used for the ACOPOSmulti drive system power mains connection. Otherwise additional protective measures must be used, such as neutralization or isolation from the power mains using an isolation transformer.

1.3.1 Rated fault current

On ACOPOSmulti drive systems, fault current protection with a rated fault current of ≥ 300 mA can be used. However, errors can occur:

- When connecting ACOPOSmulti drive systems to the power mains, contact chatter

causes single or two-phase operation. This results in short-term increases to discharge currents via the bypass capacitors in the line filter and in the power supply and inverter modules.

- Because of high frequency discharge currents occurring during operation via the bypass capacitors in the power supply and inverter modules.
- Because of high frequency discharge currents occurring during operation via long motor cables.

1.3.2 Estimating possible ACOPOSmulti drive system configurations

Estimating ACOPOSmulti drive system configurations that can be used with certain fault current protection is somewhat imprecise for two reasons:

1) The rated fault currents listed by the manufacturer are maximum currents which will definitely trip the fault current protection device. Normally, the fault current protection device is tripped at approximately 60% of the rated fault current.

2) Contact chatter when connecting the ACOPOSmulti drive system to the power mains depends on the switching device used.

To reduce problems with tripping currents, B&R carried out tests with several fault current protection device types available on the market. To reduce problems with contact chatter, B&R recommends connecting the ACOPOSmulti drive system to the power mains with a line contactor. This normally results in sufficiently short contact chatter times.

To determine if an ACOPOSmulti drive system can be operated with a certain fault current protection device, the sums of all discharge capacitances C_A in the drive system must be determined:

$$C_A[\mu F] = C_{A_{Netzfilter}}[\mu F] + C_{A_{LVM}}[\mu F] + \sum C_{A_{WRM}}[\mu F]$$

The discharge capacitances for the individual modules in the respective ACOPOSmulti drive system can be found in the following table:

ACOPOSmulti line filter	Discharge capacitance C_D
8BVF0110H000.000-1	In preparation
8BVF0440H000.001-2	14.1 µF
8BVF0880H000.000-1	14.1 µF
ACOPOSmulti power supply modules	**Discharge capacitance C_D**
8BVP0110Hx00.000-1	In preparation
8BVP0440Hx00.000-1	0.9 µF
8BVP0880Hx00.000-1	0.9 µF
ACOPOSmulti inverter modules	**Discharge capacitance C_D**
8BVI0014Hxx0.000-1	0.14 µF
8BVI0028Hxx0.000-1	0.14 µF
8BVI0055Hxx0.000-1	0.14 µF
8BVI0110HxS0.000-1	0.14 µF
8BVI0440HxS0.000-1	0.22 µF
8BVI0880HxS0.000-1	0.45 µF

Table 62: Discharge capacitances C_A of ACOPOSmulti modules

1.3.3 Manufacturers of fault current protection devices that can be used

Manufacturer	Type	Comment	Rated current [mA]
Doepke (www.doebke.de)	DFS 4B SK 63-4/0.3	AC-DC sensitive	300
	DFS 4B SKS 63-4/0.3	AC-DC sensitive selective (delayed)	
	DFS 4B SK 63-4/0.5	AC-DC sensitive	500
	DFS 4B SKS 63-4/0.5	AC-DC sensitive selective (delayed)	
ABB (www.abb.com)	F204 B-63/0.3	AC-DC sensitive	300
	F204 BS-63/0.3	AC-DC sensitive selective (delayed)	

Table 63: Manufacturers of fault current protection devices that can be used

These fault current protection devices can be used up to a total discharge capacitance C_A of approx. 20 µF for the ACOPOSmulti drive system.

1.3.4 Examples

Example 1

A check must be carried out to determine if the following ACOPOSmulti drive system can be operated with the fault current protection device ABB F204B-63/0.3:

ACOPOSmulti drive system consisting of		Discharge capacitance C_D	
Quantity	Module name	per Module	Total
1	8BVF0440H000.001-2	14.1 µF	14.1 µF
1	8BVR0440H000.001-2	---	---
1	8BVP0440HC00.000-1	0.9 µF	0.9 µF
1	8BVI0440HCS0.000-1	0.22 µF	0.22 µF
5	8BVI0028HCD0.000-1	0.14 µF	0.7 µF
Total discharge capacitance C_A			**15.92 µF**

Table 64: Checking if fault current protection devices can be used, Example 1

The total discharge capacitance C_A for this ACOPOSmulti drive system is lower than 20 µF. This ACOPOSmulti drive system can therefore be operated with the fault current protection device ABB F204B-63/0.3.

Example 2

It's necessary to check if the following ACOPOSmulti drive system can be operated with the Doepke DFS 4B SK 63-4/0.5 fault current protection device:

ACOPOSmulti drive system consisting of		Discharge capacitance C_D	
Quantity	Module name	per Module	Total
1	8BVF0880H000.000-1	14.1 µF	14.1 µF
1	8BVR0880H000.000-1	---	---
1	8BVP0880HC00.000-1	0.9 µF	0.9 µF
1	8BVI0880HCS0.000-1	0.45 µF	0.45 µF
1	8BVI0440HCS0.000-1	0.22 µF	0.22 µF
2	8BVI0110HCS0.000-1	0.14 µF	0.28 µF
3	8BVI0055HCD0.000-1	0.14 µF	0.42 µF
Total discharge capacitance C_A			**16.37 µF**

Table 65: Checking if fault current protection devices can be used, Example 2

The total discharge capacitance C_A for this ACOPOSmulti drive system is lower than 20 µF. This ACOPOSmulti drive system can therefore be operated with the Doepke DFS 4B SK 63-4/0.5 fault current protection device.

2. Motor connection

On B&R motors, the power connections, the connections for the holding brake and the connections for the motor temperature sensor are all made using the same motor plug.
The motor connection is made on the ACOPOSmulti drive system using the ACOPOSmulti inverter unit. The motor connection must be shielded correctly (see section 1.1 "Electromagnetic Compatibility of the Installation" on page 129).

The structure of the motor connection can be seen in the following diagram:

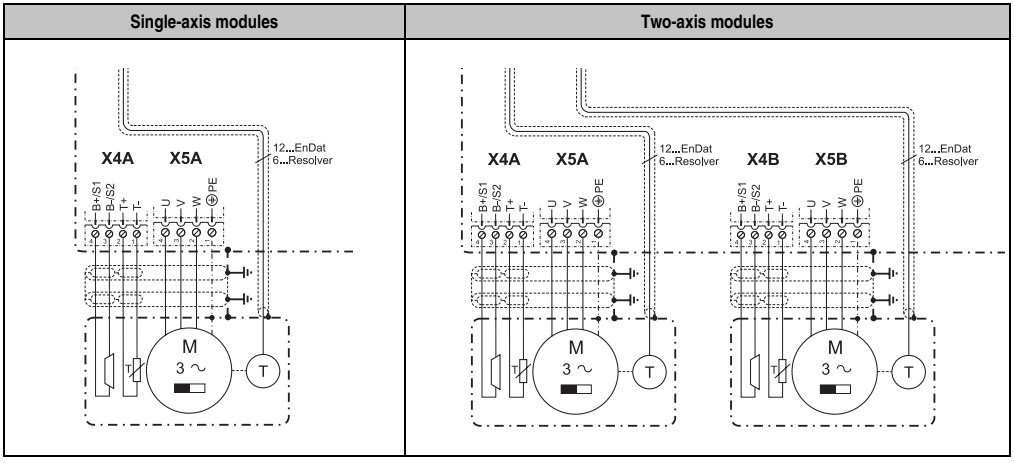


Figure 24: Circuit diagram for ACOPOSmulti inverter modules, motor connection

The cross section of the motor cable must be dimensioned for the thermal equivalent effective value of the motor current. [1)]

The cross section of the motor cable is chosen for B&R motor cables according to the following table so that the maximum current load for the cable cross section selected is greater than or equal to the thermal equivalent effective value of the motor current:

$$I_Z \geq I_q$$

1) If information concerning load torque, inertia and friction are available, the thermal equivalent effective value for the motor current of the motor used is calculated as follows:

$$I_q[A] = \sqrt{\frac{1}{T_{Zyklus}[s]} \cdot \sum_i I_i[A]^2 \cdot t_i[s]}$$

The following table shows the maximum current load for special insulated three-phase cables according to IEC 60364-5-523 at 40 °C ambient temperature [1] and 90 °C maximum cable temperature.

Line cross section [mm²]	Maximum current load on the line I_Z [A] depending on type of installation		
	Three-phase cable in insulating conduit or cable duct B2	Three-phase cable on walls C	Three-phase cable in a cable tray E
1,5	17,8	20	20,9
4	31,9 [1]	36,4 [1]	38,2 [1]
10	54,6	64,6	68,3
35	116,5	133,8	143,8

Table 66: Maximum current load for special insulated three-phase cables

1) The plug pins on the prefabricated B&R motor cable 8CMxxx.12-3 can only handle a max. load of 30 A (See also section 4.2.2 "Technische Daten für 8PM001.00-1 und 8PM002.00-1" on page 117).

When determining the cross section for the motor cable, make sure that the cross section selected is within the range that can be used with motor connection terminal X5 (see section 1.4 "Overview of the terminal cross sections" on page 167).

1) The maximum current load value in IEC 60364-5-523 is for an ambient temperature of 30 °C. The values in table 66 "Maximum current load for special insulated three-phase cables" on page 128 are calculated with the factor k_{Temp} = 0.91 given in the standard for use at 40 °C ambient temperature.
With the specified maximum current load, a reduction factor for groups of cables and individual wires is not taken into consideration. If necessary, they must be taken from the corresponding standards and included in the calculation.

Chapter 5 • Wiring

1. General information

1.1 Electromagnetic Compatibility of the Installation

1.1.1 General information

If the guidelines for elecromagnetic compatibility of the installation are followed, the ACOPOSmulti drive system meets the EMC guidelines 89/336/EWG and low-voltage guidelines 73/23/EWG. It meets the requirements for harmonized EMC product standard IEC 61800-3:1996 + A11:2000 for industry (second environment).

Additional EMC measures must be implemented by the manufacturer of machines or systems if the product standards for the machine has lower limits or if the machine should conform to generic standard IEC 61000-6-4. Proof of conformity to the necessary limits must be provided according to the documentation for use of the EMC guidelines from the manufacturer or distributor of the machine or system.

Additional EMC measures are needed when operating ACOPOSmulti drive systems in a living area or when connecting ACOPOSmulti drive systems to a low voltage system which supplies buildings in living areas without an intermediate transformer (first environment).

1.1.2 Installation notes

1) The switching cabinet or the system must be constructed appropriately.
2) To prevent the effects of disturbances, the following lines must be properly shielded:
   - motor lines
   - encoder cables
   - control lines
   - data cables
3) Inductive switching elements such as contactors or relays are to be equipped with corresponding suppressor elements such as varistors, RC elements or damping diodes.
4) All electrical connections are to be kept as short as possible.
5) Cable shields are to be attached to the designated shield terminals and the plug housing.
6) Shielded cables with copper mesh or tinned copper mesh are to be used. Twisting or extending the protective mesh using single conductors is not allowed.
7) Unused cable conductors are to be grounded on both sides if possible.

1.1.3 Connection diagrams for ground and shield connections

The ground connections and shield connections for ACOPOSmulti drive system have to be made as illustrated in the following diagrams.

8BVF line filter

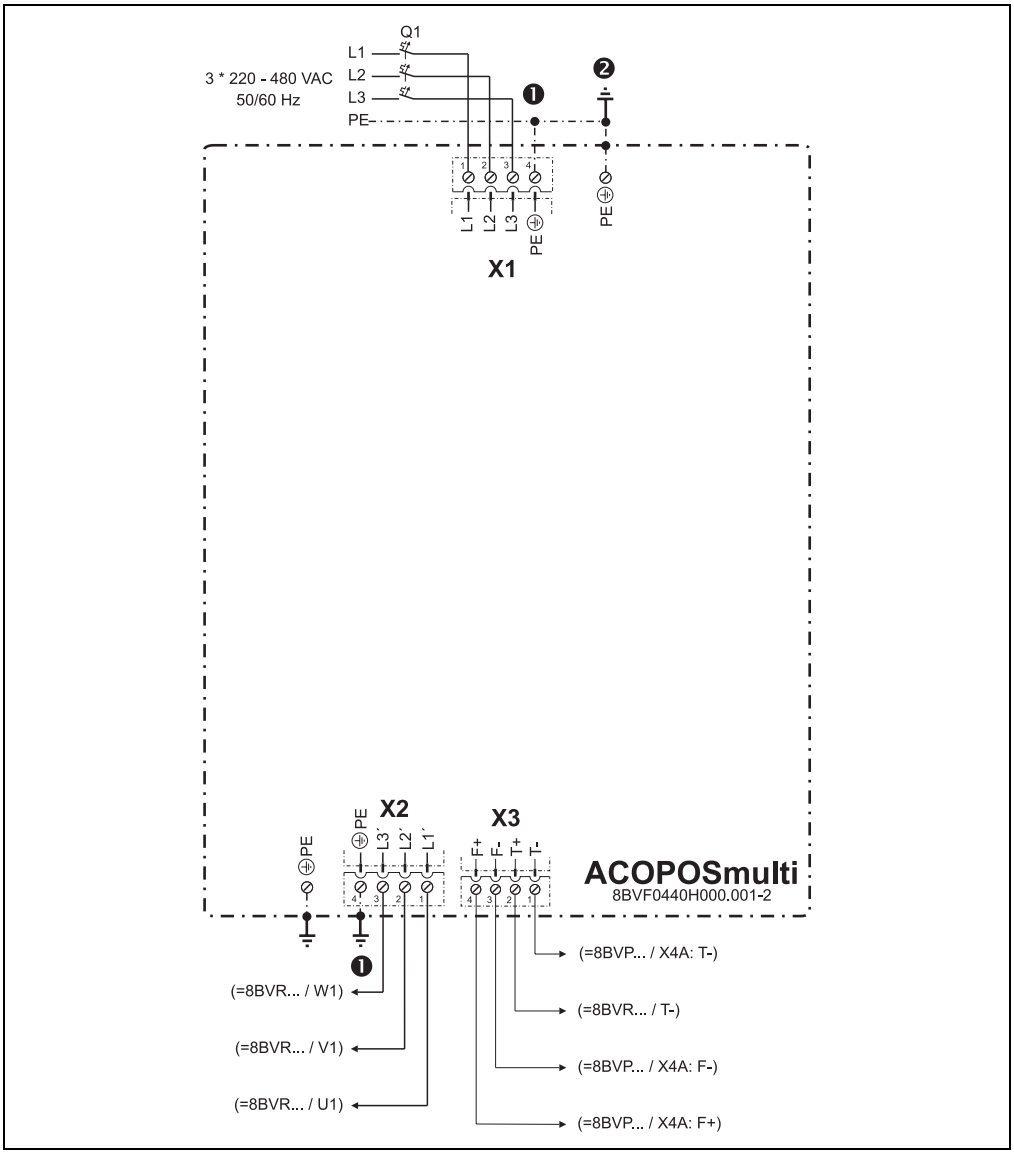


Figure 25: Ground connections and shield connections for 8BVF line filter

8BVP power supply modules

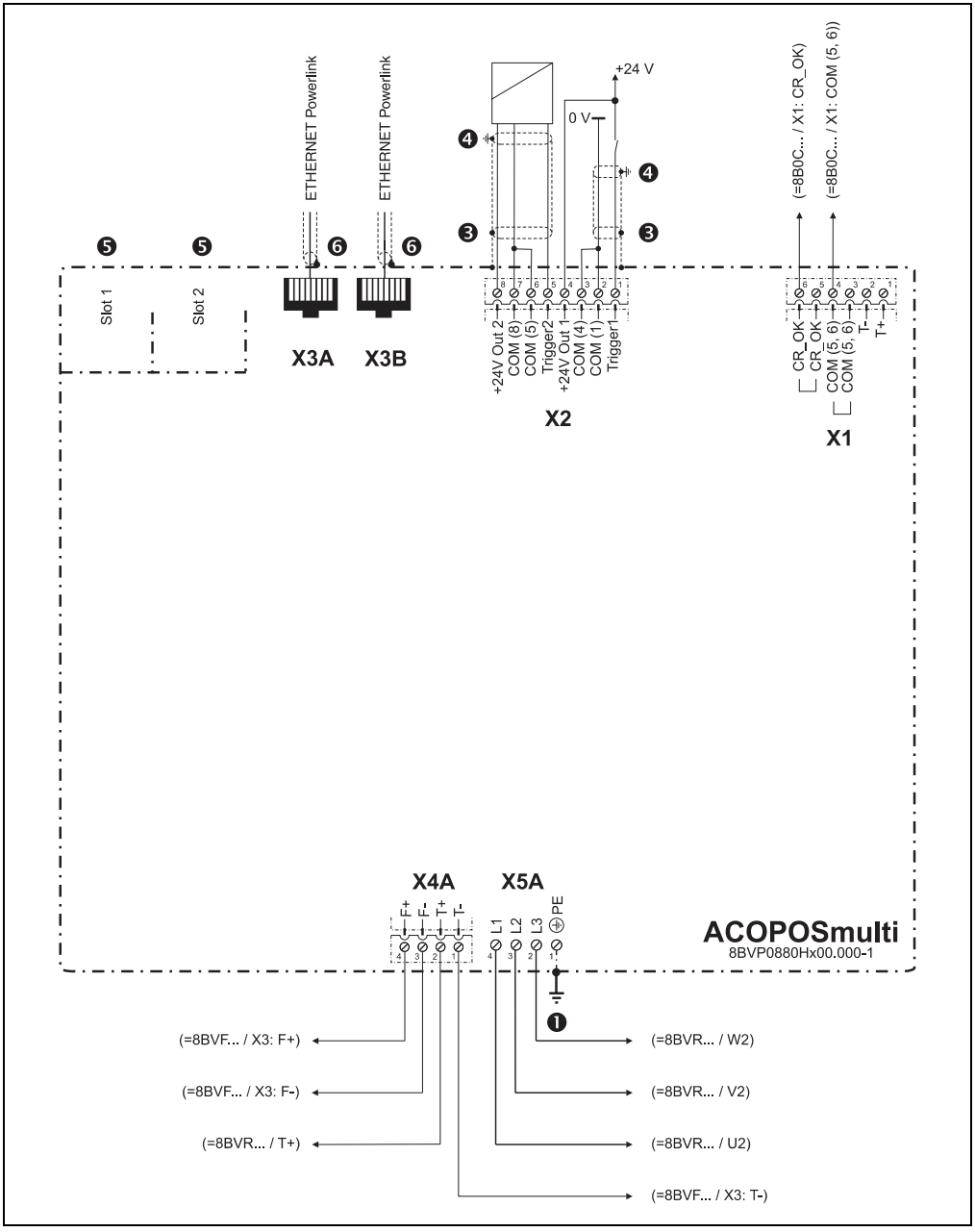


Figure 26: Ground connections and shield connections for 8BVP power supply units

8BVI inverter modules

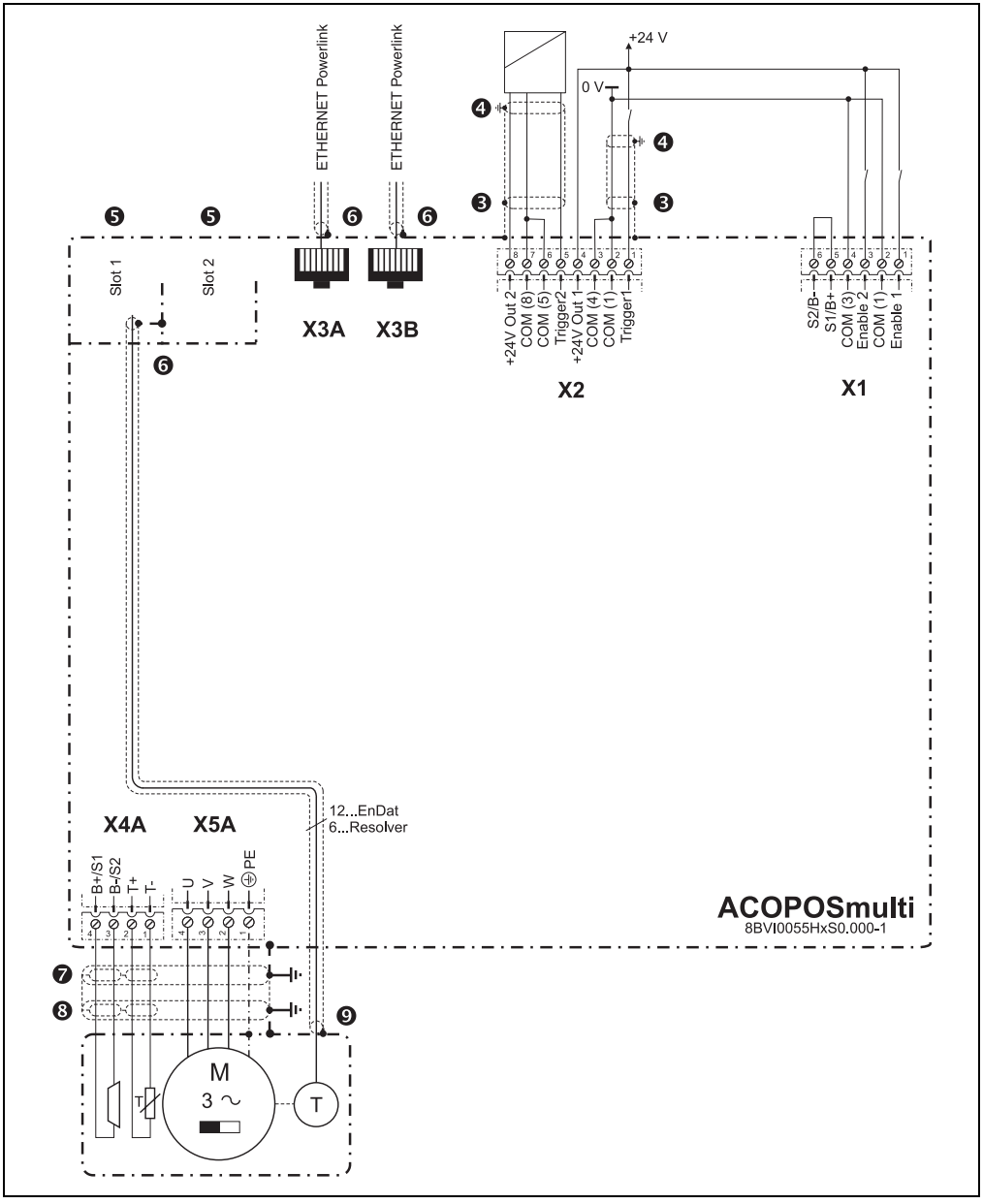


Figure 27: Ground connections and shield connections for 8BVI inverter modules

❶ The protective ground connection (PE) is internally connected to the respective module housing.

❷ The second protective ground conductor connection is required because of the increased discharge current (> 3.5 mA) on the following ACOPOSmulti modules. The same cross section as the protective ground conductor for the power mains must be used:
Line filter: 8BVF0110H000.000-1, 8BVF0440H000.000-1
Power supply units: 8BVP0110H000.000-1, 8BVP0440H000.000-1

❸ Both trigger inputs are only filtered internally with approx. 50 µs. Make sure the cable shield is grounded properly. The optional shield set 8SCS002.0000-00 can be used with this.

❹ The cable shield must be attached to the shield connector.

❺ All mounting brackets on ACOPOSmulti plug-in modules automatically come in contact with the housing when inserted in the module slot.
Open module slots on ACOPOSmulti modules can be closed with the optional shield set 8SCS005.0000-00 available from B&R:

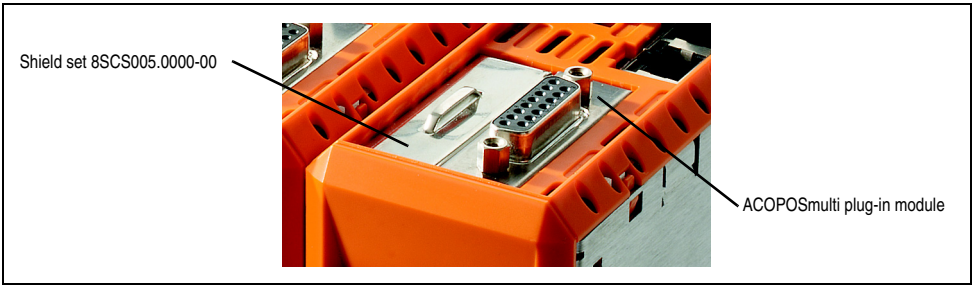


Figure 28: Use of the shield set 8SCS005.0000-00

❻ Cable connection via DSUB plug:
The cable shield must be connected using the designated clamp in the metallic or metal plated plug housing. The fastening screws must be tightened.

Cable connection via terminals:
The cable shield must be connected to the ACOPOmulti module housing using the optional shield set 8SCS002.0000-00.

Cable connection via RJ45 plug:
Also grounding the cable shield provides an improvement in EMC properties. Both sides should be properly grounded near the connector. The optional shield set 8SCS002.0000-00, available from B&R, can be used on the ACOPOSmulti module.

❼ The cable shield can be connected with the ACOPOSmulti module housing using the opional shield sets available from B&R.

❽ On the motor side, the cable shield for the motor line is connected to the motor housing using the motor plug and connected to ground via the machine.

❾ On the motor side, the encoder cable shield must be connected to the motor housing using the encoder plug and connected to ground via the machine.

For external encoders, the cable shield of the encoder cable must be connected (on the encoder side) with the machine and therefore with ground using the encoder plug.

1.2 Insulation and high voltage test

1.2.1 Insulation resistance according to EN 60204

According to EN 60204, the insulation resistance of electrical equipment is measured with 500 V DC voltage between the main circuit conductors and the protective ground conductor system and is not permitted to exceed a value of 1 MΩ. Testing individual sections of the system is permitted.

Power mains connection (mains side) for ACOPOSmulti line filters (X1)

The insulation resistance test can be carried out on the ACOPOSmulti line filter power mains connection (X1) as described above; however, values > 1 MΩ are not expected because of the overvoltage protection connection of the power mains. The 50 kΩ minimum value required by the EN 60204 Section 19.3 standard is exceeded.

Power mains connection (load side) for ACOPOSmulti line filters (X2)

The insulation resistance test can be carried out on the ACOPOSmulti line filter power mains connection (X2) as described above; however, values > 1 MΩ are not expected because of the overvoltage protection connection of the power mains. The 50 kΩ minimum value required by the EN 60204 Section 19.3 standard is exceeded.

Connections U1 / V1 / W1 of ACOPOSmulti regeneration chokes

The insulation resistance test can be carried out on the ACOPOSmulti regeneration choke U1 / V1 / W1 connections as described above. However, values > 1 MΩ should not be expected. The 50 kΩ minimum value required by the EN 60204 Section 19.3 standard is exceeded.

Connections U2 / V2 / W2 of ACOPOSmulti regeneration chokes

The insulation resistance test can be carried out on the ACOPOSmulti regeneration choke U2 / V2 / W2 connections as described above. However, values > 1 MΩ should not be expected. The 50 kΩ minimum value required by the EN 60204 Section 19.3 standard is exceeded.

Power mains connection of ACOPOSmulti power supply modules (X5A)

The insulation resistance test can be carried out on the power mains connection (X5A) of ACOPOSmulti power supply modules as described above; however, values > 1 MΩ are not expected because of the overvoltage protection connection of the power mains. The 50 kΩ minimum value required by the EN 60204 Section 19.3 standard is exceeded.

Motor connection of ACOPOSmulti inverter modules (X5A / X5B)

Warning!

An insulation test is not permitted to be carried out on the motor connection (X5A / X5B) of ACOPOSmulti inverter modules because that would destroy the ACOPOSmulti inverter modules!

The motor cable must be removed from the motor connection (X5A / X5B) of the ACOPOSmulti inverter module before the insulation resistance is measured!

B&R motors and B&R motor cables

In principle, an insulation resistance measurement can be carried out on B&R motor cables and B&R motors. However, the insulation resistance can be lower than 1 MΩ depending on the motor that is connected. The 50 kΩ minimum value required by the EN 60204 Section 19.3 standard is exceeded.

Warning!

An insulation test is not permitted to be carried out on the motor connection (X5A / X5B) of ACOPOSmulti inverter modules because that would destroy the ACOPOSmulti inverter modules!

The motor cable must be removed from the motor connection (X5A / X5B) of the ACOPOSmulti inverter module before the insulation resistance is measured!

1.2.2 High voltage test

According to EN 60204, the electrical equipment must be able to withstand a test voltage connected between the conductors of all all circuits and the protective ground conductor system for at least 1 s (exception: all circuits with a voltage < PELV voltage). The test voltage must be twice the rated voltage for the equipment, and at least 1000 VAC (50 / 60 Hz). Components that cannot handle this test voltage must be disconnected before carrying out the high voltage test.

Power mains connection (mains side) for ACOPOSmulti line filters (X1)

Warning!

A high voltage test is not permitted to be carried out on the power mains connection (X1) of ACOPOSmulti line filters because that would destroy the ACOPOSmulti line filter!

Power mains connection (load side) for ACOPOSmulti line filters (X2)

Warning!

A high voltage test is not permitted to be carried out on the power mains connection (X2) of ACOPOSmulti line filters because that would destroy the ACOPOSmulti line filter!

Connections U1 / V1 / W1 of ACOPOSmulti regeneration chokes

The high voltage test can be carried out on the ACOPOSmulti regeneration choke U1 / V1 / W1 connections as described above.

Warning!

Before performing the high voltage test on the U1 / V1 / W1 connections of the ACOPOSmulti regeneration choke, the cable between the X2 connection of the ACOPOSmulti line filter and the U1 / V1 / W1 connections of the ACOPOSmulti regeneration choke must be removed from the X2 connection of the ACOPOSmulti line filter. Otherwise the ACOPOSmulti line filter will be severely damaged!

Connections U2 / V2 / W2 of ACOPOSmulti regeneration chokes

The high voltage test can be carried out on the ACOPOSmulti regeneration choke U2 / V2 / W2 connections as described above.

Warning!

Before performing the high voltage test on the U2 / V2 / W2 connections of the ACOPOSmulti regeneration choke, the cable between the X5A connection of the ACOPOSmulti power supply module and the U2 / V2 / W2 connections of the ACOPOSmulti regeneration choke must be removed from the X5A connection of the ACOPOSmulti power supply module. Otherwise the ACOPOSmulti power supply module will be severely damaged!

Power mains connection of ACOPOSmulti power supply modules (X5A)

Warning!

A high voltage test cannot be carried out on the power mains connection (X5A) of the ACOPOSmulti power supply modules because sparks can occur that are caused by the internal wiring.

Motor connection of ACOPOSmulti inverter modules (X5A / X5B)

Warning!

A high voltage test is not permitted to be carried out on the motor connection (X5A / X5B) of ACOPOSmulti inverter modules because that would destroy the ACOPOSmulti inverter modules!

B&R motors and B&R motor cables

In principle, a high voltage test can be carried out on B&R motor cables and B&R motors. Depending on the size of the motor and length of the motor cable, increased measurement currents can occur because of capacitive coupling.

Warning!

A high voltage test is not permitted to be carried out on the motor connection (X5A / X5B) of ACOPOSmulti inverter modules because that would destroy the ACOPOSmulti inverter modules!

The motor cable must be removed from the motor connection (X5A / X5B) of the ACOPOSmulti inverter module before the high voltage measurement is made!

1.2.3 Typical procedure

Isolation test

1) Remove the motor cable from the X5A / X5B connection of the ACOPOSmulti inverter module.
2) Perform the insulation test on the X1 power mains connection (mains side) of the ACOPOSmulti line filter.
3) Perform the insulation test on the B&R motor.

High voltage test

1) Remove the connection cable between the X2 connection of the ACOPOSmulti line filter and the U1 / V1 / W1 connections of the ACOPOSmulti regeneration choke on the X2 connection of the ACOPOSmulti line filter.
2) Remove the connection cable between the X5A connection of the ACOPOSmulti power supply module and the U2 / V2 / W2 connections of the ACOPOSmulti regeneration choke on the X5A connection of the ACOPOSmulti power supply module.
3) Perform the high voltage test on the U1 / V1 / W1 connections of the ACOPOSmulti regeneration choke.
4) Remove the motor cable from the X5A / X5B connection of the ACOPOSmulti inverter module.
5) Perform the high voltage test on the B&R motor.

1.3 Standard safety technology ("Wired safety technology")

1.3.1 General information

ACOPOSmulti inverter modules use an integrated secure pulse inhibitor for secure shutdown and to prevent unwanted startup. This is designed to meet the following safety classifications depending on the external circuit: [1)]

EN 954-1[1)] Category	IEC 61508-2[2)] SIL (Safety Integrity Level)	ISO 13849 PL (Performance Level)
4	3	e
3	2	d

Table 67: Safety classifications in accordance with different standards

1) The EN 954-1 is no longer valid and has been replaced by ISO 13849.
2) Certification in accordance to IEC 61508-2 in preparation.

The following table provides an overview of the individual safety functions that can be implemented:

Label according to standard		Short description
EN 61800-5-2	EN 60204-1	
STO (Safe Torque Off)	Stop category 0	Energy feed cutoff
SS1 (Safe Stop 1)	Stop category 1	Introduction of active braking and activation of the STO function after a defined amount of time has expired
SS2 (Safe Stop 2)	Stop category 2	Introduction of active braking and activation of the SOS function after a defined amount of time has expired
SLS (Safely-Limited Speed)	---	Protection against exceeding a defined limit speed
SOS (Safe Operating Stop)	---	Protection against impermissible position deviation

Table 68: Overview of safety functions according to standard

The secure pulse inhibitor interrupts the supply to the motor by preventing the pulses to the IGBTs over two channels. In this way, a rotating field can no longer be created in synchronous and induction motors controlled by the ACOPOSmulti inverter modules.

Therefore, the integrated secure pulse inhibitor meets the requirements for preventing unwanted startup in accordance to EN 1037 as well as the requirements in regard to category 0 and 1 stop functions in accordance with EN 60204-1. Both stop functions require the supply to the machine drives to be switched off (immediately for category0 and after reaching standstill for category1). The requirements in regard to the safety functions STO, SS1, SS2, SLS and SOS are also met in accordance to EN 61800-5-2.

Subsequently, the nomenclature of EN 61800-5-2 (STO, SS1, SS2, SLS, SOS) will always be taken into consideration.

1) A detailed explanation of the standards and safety functions can be found in chapter 7, "Standards and Certifications".

1.3.2 Principle - Realization of the Safety Function

Secure restart inhibit is obtained by removing the IGBT driver supply in the ACOPOSmulti inverter modules. Terminals X1 / Enable1 and X1 / COM (1) as well as X1 / Enable 2 and X1 / COM (3) are used to supply two integrated DC-DC converters with 24 VDC. The two DC-DC converters create the supply voltage for the IGBT driver from this voltage.

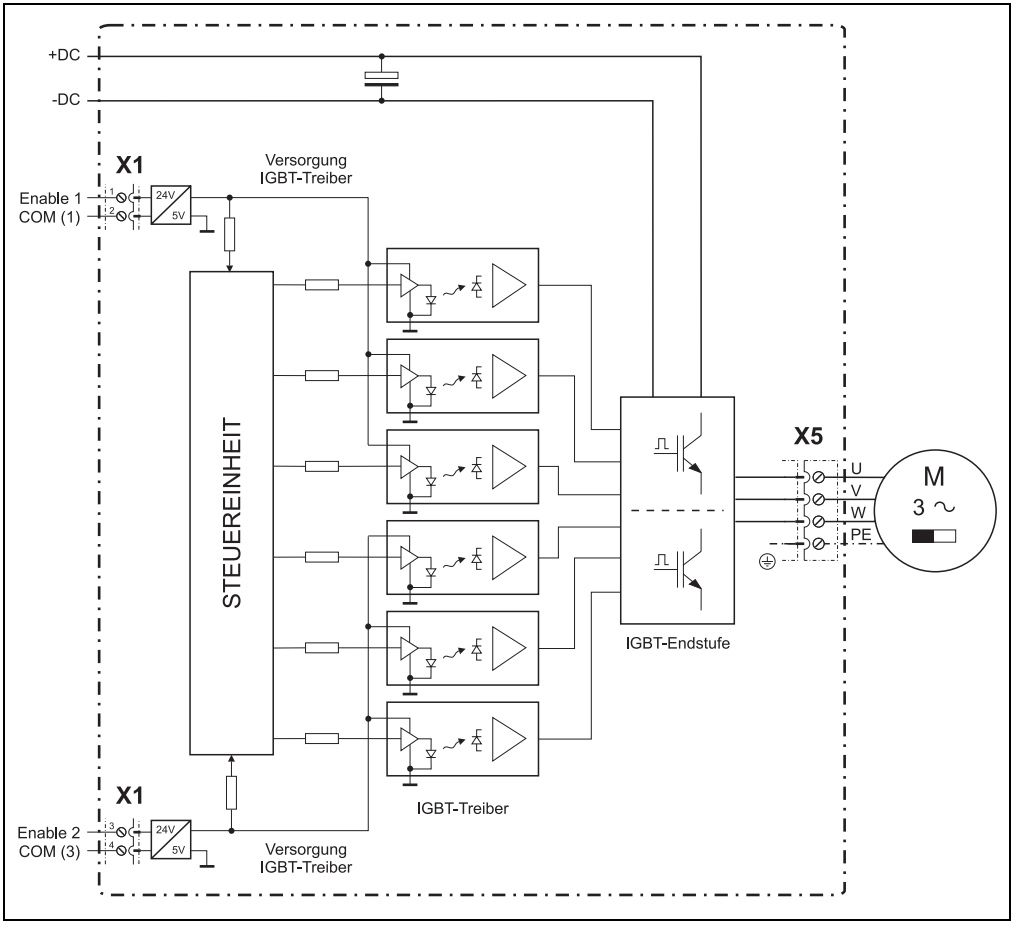


Figure 29: Block diagram of secure restart inhibit

If the 24 VDC voltage supply for one of the DC-DC converters is interrupted, the corresponding IGBT driver is also no longer supplied. It is then no longer possible to transfer the modulation pattern needed to generate the rotating field on the IGBT output stage. The energy feed to the motor is cut off.

Additional Function

The control unit makes a query to check if the output voltage of the two DC-DC converters is present. If voltage is not present on the output of one of the two DC-DC converters, then generation of the modulation pattern is suppressed by the control unit.

Danger!

After activating the secure pulse inhibitor using terminals X1 / Enable 1 and X1 / COM (1) or X1 / Enable 2 and X1 / COM (3), the motor is de-energized and therefore torque-free. If the motor was moving before activation of the secure pulse inhibitor, it is only stopped by a secure operational brake (available under certain conditions) or from the friction of the entire system. Therefore, the motor is not able to hold hanging loads. Secure holding brakes must be used for this purpose.

Danger!

Activation of the secure pulse inhibitor via the terminals X1 / Enable1 and X1 / COM (1) or X1 / Enable 2 and X1 / COM (3) is not sufficient for achieving a voltage-free drive and therefore does not provide sufficient protection against electrical shock!

Danger!

Depending on the application, it is possible for the drive to startup again after deactivating the secure pulse inhibitor.

Danger!

The brake controller integrated in the ACOPOSmulti inverter modules and the holding brake integrated in the B&R standard motors are sufficient for the safety category B in accordance to EN 954-1.

Additional measures must be taken to achieve higher safety categories.

Danger!

The respective C-standards for the applications must be adhered to!

Information:

Take note that multiple errors in the IGBT bridge can cause a short forward movement. The maximum rotary angle of the forward movement φ on the motor shaft depends on the motor used. For permanently excited synchronous motors, $\varphi = 360°/2p$ (for B&R standard motors, p = 3 and the angle is therefore 60°). For three-phase current asynchronous motors, there is a relatively small angle of rotation (between 5° and 15°).

This short forward movement can be ruled out as error according to EN 954-1, chapter 7.2 among other things, due to the improbability that this would occur and due to general technical experience.

1.3.3 Enable input circuit in accordance with the required safety category / SIL / PL

In the example of the STO safety function, different circuit variations for the Enable input on ACOPOSmulti inverter modules are displayed according to the required safety category / SIL / PL.

Danger!

All errors (e.g. cross connections) that are not detected can lead to a loss of safety functioning.

Suitable measures that justify a faulty connection for the error must be taken. A few examples of suitable measures include insulated laying of wires or double insulation.

To achieve safety category 4 / SIL 3 / PL e, it must be ensured that a buildup of errors does not lead to a loss of safety functioning. Monitoring can be aborted after the third error if the likelihook that more errors will occur can be considered low.

To achieve safety category 3 / SIL 2 / PL d, it must be ensured that a single error does not lead to a loss of safety functioning.

STO, category 4 / SIL 3 / PL e (variant A)

An Enable input on the ACOPOSmulti inverter module is supplied with +24 V via a switching contact of a secure E-stop switching device. The COM of the second Enable input on the ACOPOSmulti inverter module is supplied with 0 V via an additional switching contact of a secure E-stop switching device. When the S1 E-stop button is pressed, both switching contacts on the E-stop switching device are opened and the Enable input as well as the COM of the second Enable input are separated.

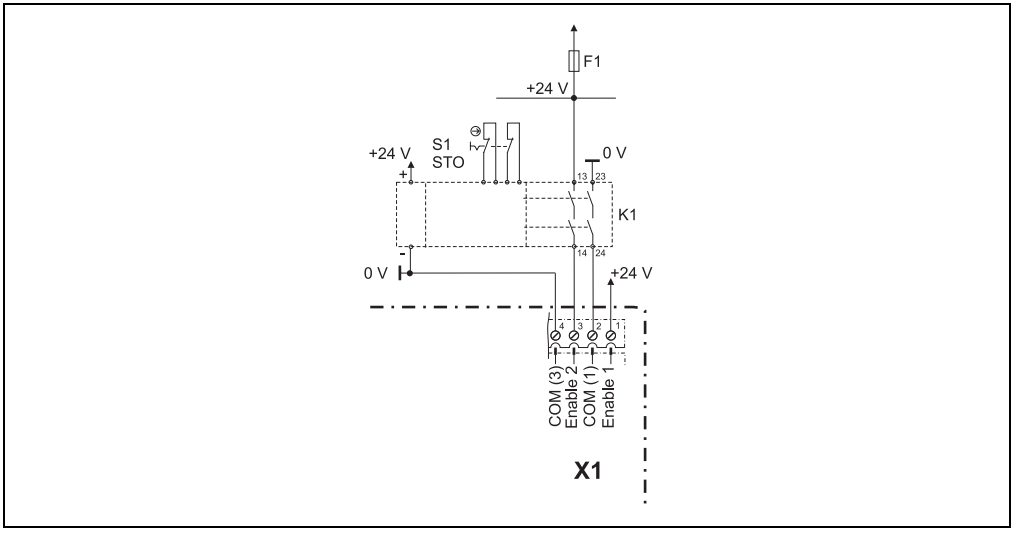


Figure 30: STO, category 4 / SIL 3 / PL e (variant A)

This circuit covers a majority of the wiring and isolation errors in the area of supply lines to the E-stop switching device and to the Enable inputs.

The following errors can occur in the external circuit: [1)]

Error	Error description	Result	Safety function in accordance to Category 4 / SIL 3 / PL e Remains?
1	Interruption of the supply line to connection 13	Energy to the motor is cut off	Yes
2	Interruption of the supply line to connection 23	Energy to the motor is cut off	Yes
3	Short-circuit between connection 13 and 23	F1 fuse triggered immediately	Yes
4	Short-circuit between connection 13 and 0 V	F1 fuse triggered immediately	Yes

Table 69: List of possible errors

1) The connection numbers refer to the image 30 "STO, category 4 / SIL 3 / PL e (variant A)".

Error	Error description	Result	Safety function in accordance to Category 4 / SIL 3 / PL e Remains?
5	Short-circuit between connection 23 and +24 V	F1 fuse triggered immediately	Yes
6	Short-circuit between connection 13 and 24	F1 fuse triggered by request from the safety function	Yes
7	Short-circuit between connection 23 and 14	F1 fuse triggered by request from the safety function	Yes
8	**Short-circuit between connection 13 and 14**	**Unknown error**	**No, safety function relapse to category 3 / SIL 2 / PL d**
9	**Short-circuit between connection 23 and 24**	**Unknown error**	**No, safety function relapse to category 3 / SIL 2 / PL d**
10	Interruption of the supply line to connection 14	Energy to the motor is cut off	Yes
11	Interruption of the supply line to connection 24	Energy to the motor is cut off	Yes
12	Short-circuit between connection 14 and 0 V	F1 fuse triggered by request from the safety function	Yes
13	Short-circuit between connection 24 and +24 V	F1 fuse triggered by request from the safety function	Yes
14	**Short-circuit between connection 14 and +24 V**	**Unknown error**	**No, safety function relapse to category 3 / SIL 2 / PL d**
15	**Short-circuit between connection 24 and +0 V**	**Unknown error**	**No, safety function relapse to category 3 / SIL 2 / PL d**

Table 69: List of possible errors (cont.)

Danger!

The S1 switch displayed requires the use of a two-pin switching device with the category 4 / SIL 3 / PL e with positive opening contact according to EN 60947-5-1. A two-pin switching device with the category 4 / SIL 3 / PL e must be used for the displayed K1 relay.

The instructions in the switching device's user documentation must be followed!

The following errors according to table 69 "List of possible errors" must be eliminated by taking sufficient measures for the wiring (protected against short-circuit):

- **Error 8**
- **Error 9**
- **Error 14**
- **Error 15**

STO, category 4 / SIL 3 / PL e (variant B)

The two Enable inputs on the ACOPOSmulti inverter module are supplied via a secure digital output (Out1+, Out1-). If the safety function is requested, then the secure digital output separates the two Enable inputs.

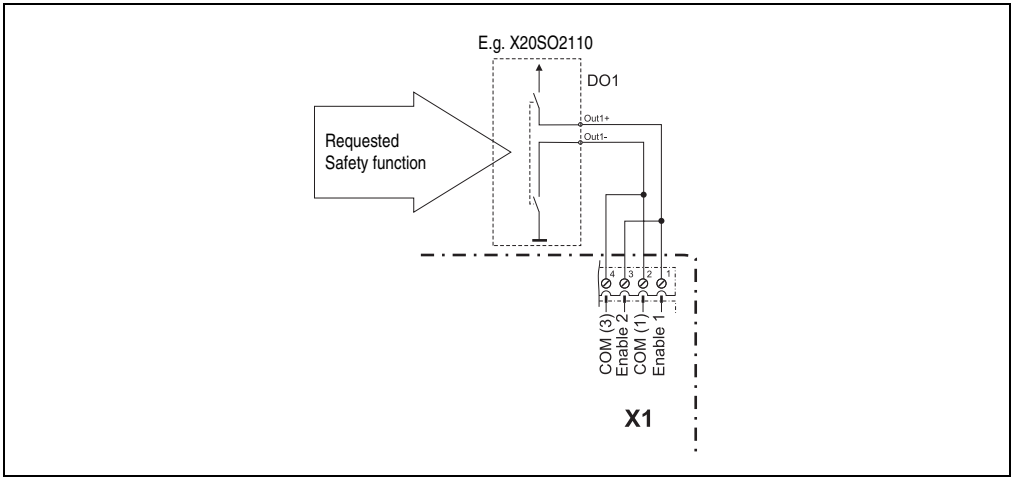


Figure 31: STO, category 4 / SIL 3 / PL e (variant B)

Errors in the external wiring do not have to be investigated because they are detected by the secure digital output.

Danger!

A secure digital output module with the category 4 / SIL 3 / PL e must be used for the displayed DO1 digital output.

The instructions in the secure digital output module's user documentation must be followed!

STO, category 3 / SIL 2 / PL d

By pressing an E-stop button, both Enable inputs on the ACOPOSmulti inverter module are separated by a switch from the +24 V supply, thereby cutting off the energy feed to the motor.

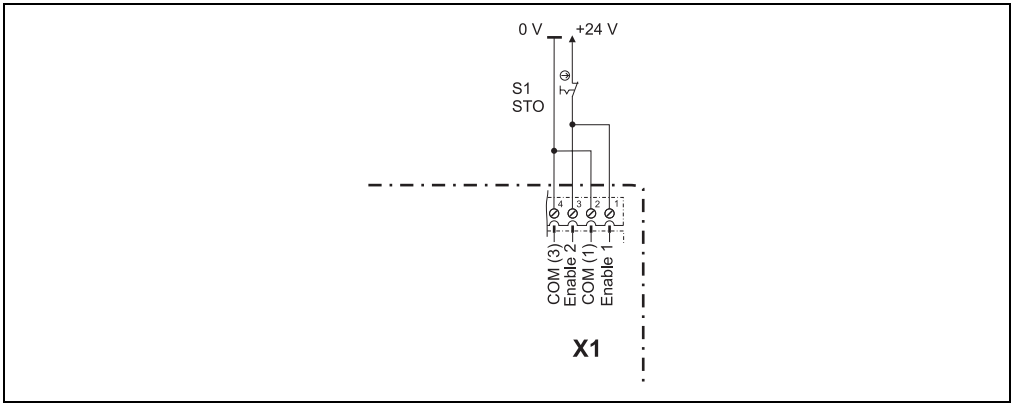


Figure 32: STO, category 3 / SIL 2 / PL d

Danger!

The S1 switch displayed requires the use of a one-pin switching device with the category 3 / SIL 2 / PL d with positive opening contact according to EN 60947-5-1.

The instructions in the switching device's user documentation must be followed!

1.3.4 Enable input circuits according to the required safety category / SIL / PL and functionality (STO, SS1, SS2, SLS, SOS)

The following illustrates exemplary wiring suggestions for the external circuit of the Enable inputs on ACOPOSmulti inverter modules. The examples vary by safety classification in accordance to EN 60204-1, ISO 13849 and EN 61800-5-2 and according to the safety function (STO, SS1, SS2, SLS, SOS).

STO, SLS, SOS - Safety category 4 / SIL 3 / PL e

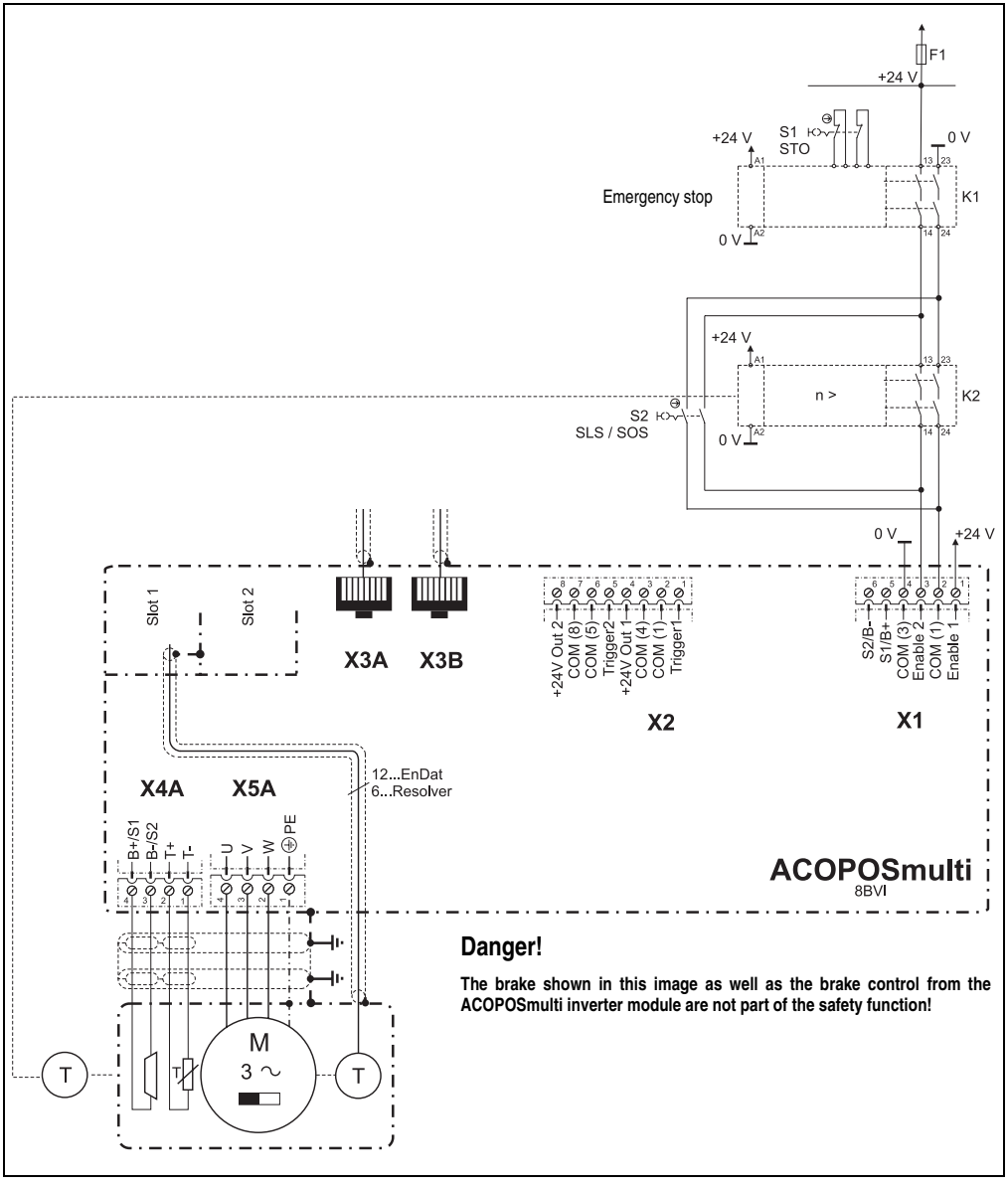


Figure 33: STO, SLS, SOS - Safety category 4 / SIL 3 / PL e

Description

STO:

The switching contacts of the K1 E-stop switching device are released when the S1 E-stop button is pressed. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is immediately cut off.

Secure restart inhibit:

If you open and lock E-stop switch S1, unexpected startup is prevented.

SLS:

The SLS safety function is activated by opening the S2 switch. The switching contacts of the K2 speed relay are opened when the limit speed set on the speed relay is exceeded. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is immediately cut off when the limit speed set on the K2 speed relay is exceeded.

SOS:

The SOS safety function is activated by opening the S2 switch. The switching contacts of the K2 standstill monitor are opened when the standstill monitor is activated. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is immediately cut off when the K2 standstill monitor is activated.

Information about SLS and SOS:

The SLS safety function or the SOS safety function can be implemented depending on the function of the K2 switching device (speed relay or standstill monitor).

Danger!

The S1 and S2 switches displayed require the use of a two-pin switching device with the category 4 / SIL 3 / PL e with positive opening contact according to EN 60947-5-1. A two-pin E-stop switching device with the category 4 / SIL 3 / PL e must be used for the displayed K1 and K2 relays.

The instructions in the switching device's user documentation must be followed!

SS1, SLS, SS2 - Safety category 4 / SIL 3 / PL e (variant A)

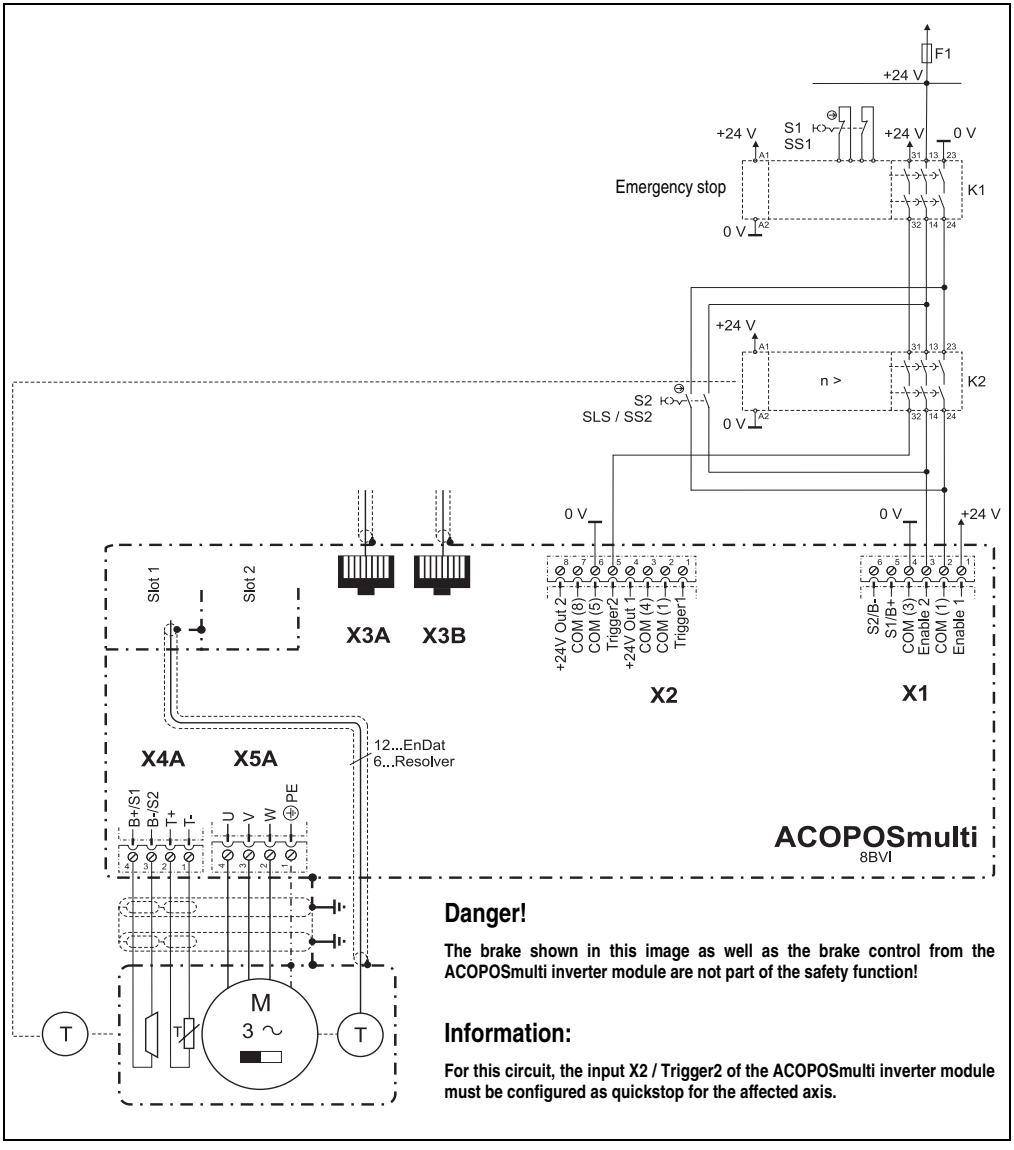


Figure 34: SS1, SLS, SS2 - Safety category 4 / SIL 3 / PL e (variant A)

Description

SS1:

When the S1 E-stop button is pressed, an active braking procedure is triggered via an immediate switching contact of the K1 E-stop switching device on the input X2 / Trigger2 of the ACOPOSmulti inverter module. The delayed switching contacts of the K1 E-stop switching device are released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time.

Secure restart inhibit:

If you open and lock E-stop switch S1, unexpected startup is prevented.

SLS:

The SLS safety function is activated by opening the S2 switch. If the limit speed set on the K2 speed relay is exceeded, an active braking procedure is triggered via an immediate switching contact of the K2 speed relay on the input X2 / Trigger2 of the ACOPOSmulti inverter module. The delayed switching contacts of the K2 speed relay are released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the limit speed set on the K2 speed relay is exceeded.

SS2:

The SS2 safety function is activated by opening the S2 switch. If the K2 standstill monitor is activated, an active braking procedure is triggered via an immediate switching contact of the K2 standstill monitor on the input X2 / Trigger2 of the ACOPOSmulti inverter module. The delayed switching contacts of the K2 standstill monitor are released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the K2 standstill monitor is activated.

Information about SLS and SS2:

The SLS safety function or the SS2 safety function can be implemented depending on the function of the K2 switching device (speed relay or standstill monitor).

Danger!

The S1 and S2 switches displayed require the use of a two-pin switching device with the category 4 / SIL 3 / PL e with positive opening contact according to EN 60947-5-1. A two-pin E-stop switching device with the category 4 / SIL 3 / PL e must be used for the displayed K1 and K2 relays.

The instructions in the switching device's user documentation must be followed!

SS1, SLS, SS2 - Safety category 4 / SIL 3 / PL e (variant B)

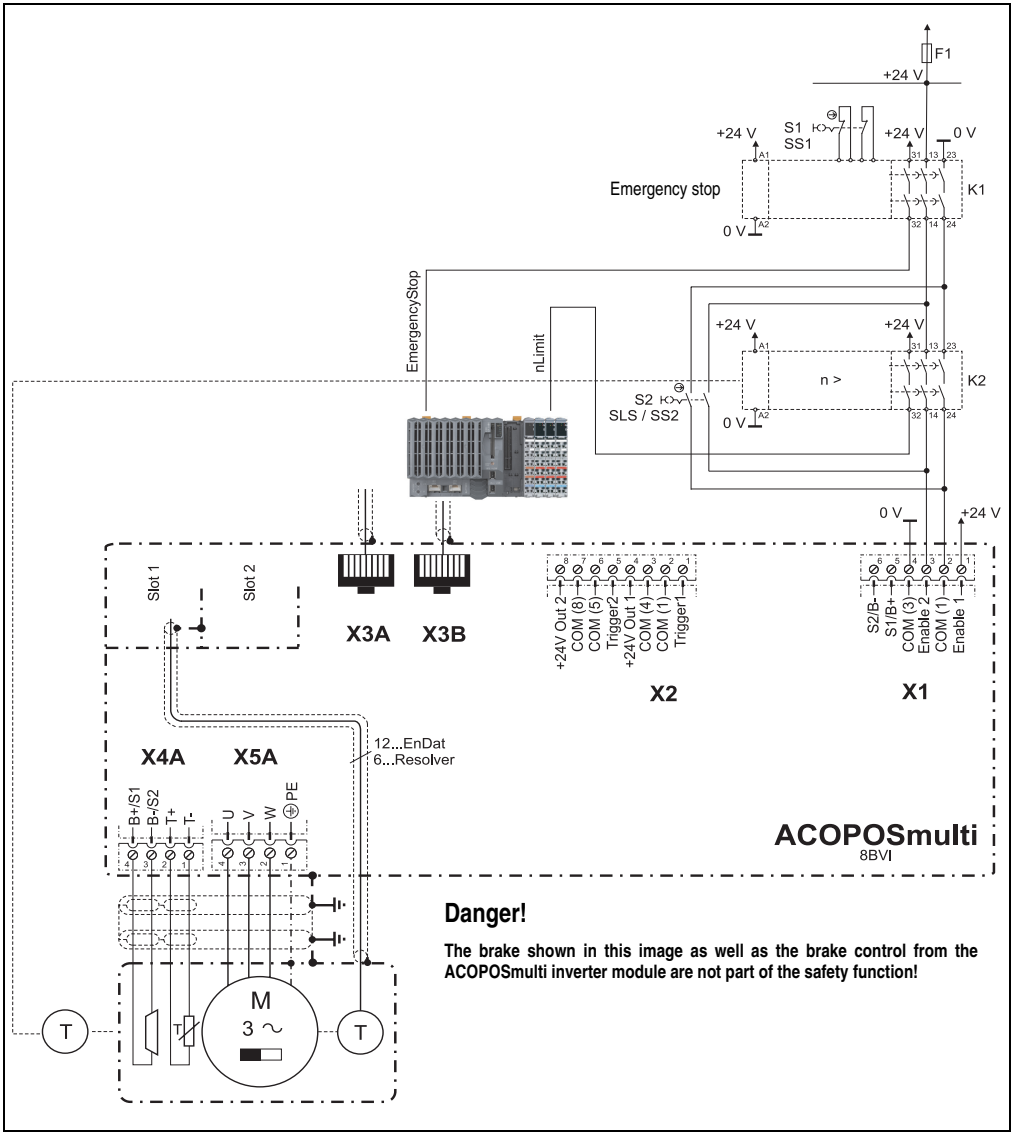


Figure 35: SS1, SLS, SS2 - Safety category 4 / SIL 3 / PL e (variant B)

Description

SS1:

After pressing the S1 E-stop button, an active braking procedure is triggered via the Ethernet POWERLINK network via an immediate switching contact of the K1 E-stop switching device on the digital input "EmergencyStop" on the controller (see "Code Example" on page 156). The delayed switching contacts of the K1 E-stop switching device are released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time.

Secure restart inhibit:

If you open and lock E-stop switch S1, unexpected startup is prevented.

SLS:

The SLS safety function is activated by opening the S2 switch. If the limit speed set on the K2 speed relay is exceeded, an active braking procedure is triggered via the Ethernet POWERLINK network via an immediate switching contact of the K2 speed relay on the "EmergencyStop" digital input on the controller (see "Code Example" on page 156). The delayed switching contacts of the K2 speed relay are released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the limit speed set on the K2 speed relay is exceeded.

SS2:

The SS2 safety function is activated by opening the S2 switch. If the K2 standstill monitor is activated, an active braking procedure is triggered via the Ethernet POWERLINK network via an immediate switching contact of the K2 standstill monitor on a digital input of the controller ("nLimit") (see "Code Example" on page 156). The delayed switching contacts of the K2 standstill monitor are released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the K2 standstill monitor is activated.

Information:

The SLS safety function or the SS2 safety function can be implemented depending on the function of the K2 switching device (speed relay or standstill monitor).

Danger!

The S1 and S2 switches displayed require the use of a two-pin switching device with the category 4 / SIL 3 / PL e with positive opening contact according to EN 60947-5-1. A two-pin E-stop switching device with the category 4 / SIL 3 / PL e must be used for the displayed K1 and K2 relays.

The instructions in the switching device's user documentation must be followed!

Code Example

Placing the stop command via Ethernet POWERLINK:

```
if ( ! stop_active )
{
/* Movement stop not active: Test stop inputs */
    if ( EmergencyStop == ncLOW )
    {
    /* Activate movement stop with parameter set for "emergency stop" */
       stop_index = E_STOP_INDEX;
       step = MOV_STOP;
       stop_active = 1;
    }
    else if ( nLimit == ncLOW )
    {
    /* Activate movement stop with parameter set for "low speed" */

       stop_index = NLIMIT_INDEX;
       step = MOV_STOP;
       stop_active = 1;
    }
}
else
{
/* Movement stop was activated */
    if ( EmergencyStop == ncHIGH && nLimit == ncHIGH
          && step!= W_MOVE_STOP )
    {
    /* Movement stop completed */
       stop_active = 0;
    }
}
```

```
switch(step)
{
    ...
    case MOV_STOP:
    /* Call NC action for movement stop */
        p_ax_dat->move.stop.index.command = stop_index;

        action_status = ncaction(ax_obj,ncMOVE,ncSTOP);
        if ( action_status == ncOK )
        {
            step = W_MOVE_STOP;
        }
        break;

    case W_MOVE_STOP:
    /* Wait for completion of movement stop */
        if (p_ax_dat->move.mode == ncOFF)
        {
        /* Movement stop completed */
            step = <NEXT_STEP>
        }
        break;
    ...
}
```

STO, SLS, SOS - Safety category 3 / SIL 2 / PL d

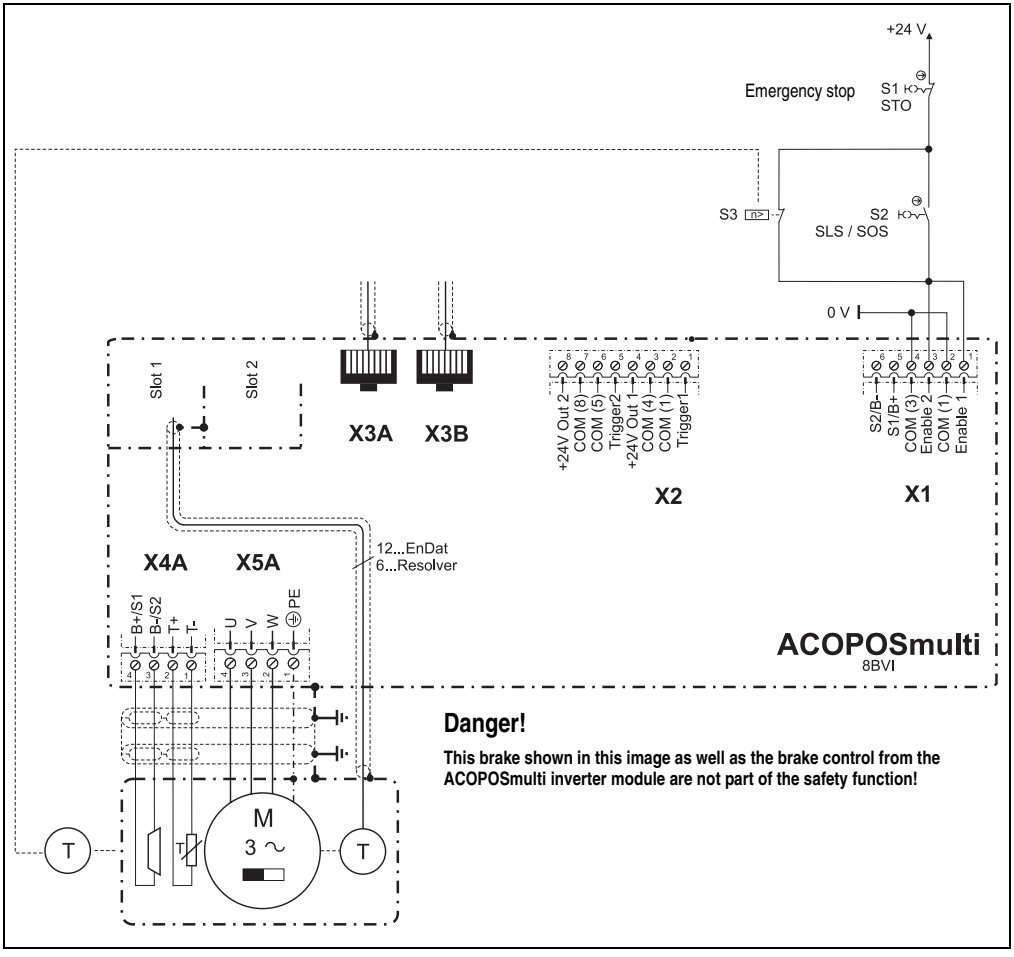


Figure 36: STO, SLS, SOS - Safety category 3 / SIL 2 / PL d

Description

STO:

Both Enable inputs on the ACOPOSmulti inverter module are separated by pressing the S1 E-stop button. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is immediately cut off.

Secure restart inhibit:

If you open and lock E-stop switch S1, unexpected startup is prevented.

SLS:

The SLS safety function is activated by opening the S2 switch. The switching contact of the S3 speed relay is opened when the limit speed set on the speed relay is exceeded. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is immediately cut off when the limit speed set on the S3 speed relay is exceeded.

SOS:

The SOS safety function is activated by opening the S2 switch. The switching contact of the speed relay is opened when the S3 standstill monitor is activated. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is immediately cut off when the S3 standstill monitor is activated.

Information about SLS and SOS:

The SLS safety function or the SOS safety function can be implemented depending on the function of the S3 switching device (speed relay or standstill monitor).

Danger!

The S1 and S2 switches displayed require the use of a one-pin switching device with the category 3 / SIL 2 / PL d with positive opening contact according to EN 60947-5-1. A one-pin switching device with the category 3 / SIL 2 / PL d must be used for the displayed S3 switching device.

The instructions in the switching device's user documentation must be followed!

SS1, SLS, SS2 - Safety category 3 / SIL 2 / PL d (variant A)

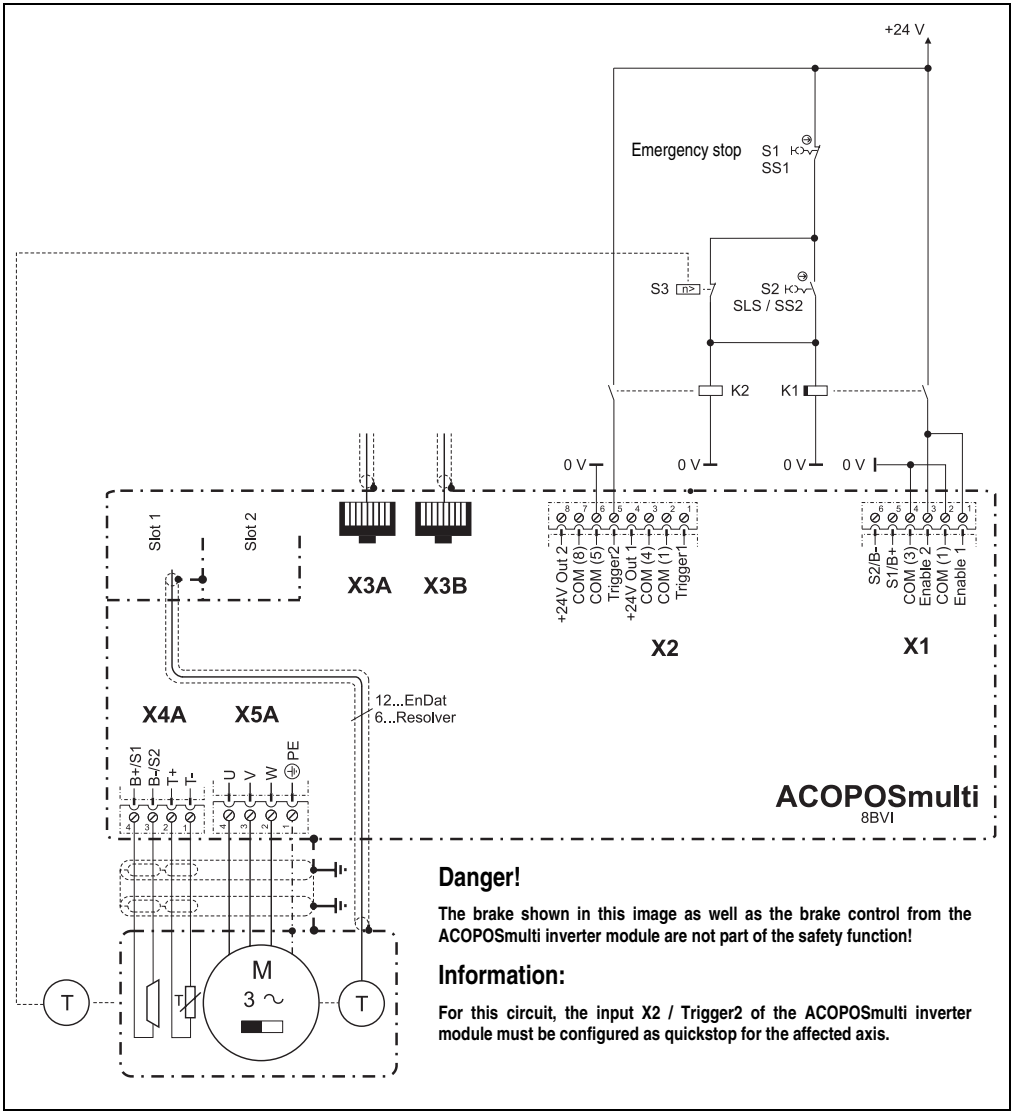


Figure 37: SS1, SLS, SS2 - Safety category 3 / SIL 2 / PL d (variant A)

Description

SS1:

Pressing e-stop switch S1 causes relay K2 to be released. As a result, an active braking procedure is triggered via the input X2 / Trigger2 of the ACOPOSmulti inverter module.

If the drive, etc. fails, then the K1 auxiliary relay with drop-out time lag is released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time.

Secure restart inhibit:

If you open and lock E-stop switch S1, unexpected startup is prevented.

SLS:

The SLS safety function is activated by opening the S2 switch. The S3 speed relay and the K2 relay are released when the limit speed set on the S3 speed relay is exceeded. As a result, an active braking procedure is triggered via the inputX2 / Trigger2 of the ACOPOSmulti inverter module.

If the drive, etc. fails, then the K1 auxiliary relay with drop-out time lag is released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the limit speed set on the S3 speed relay is exceeded.

SS2:

The SS2 safety function is activated by opening the S2 switch. The K2 relay is released when the S3 standstill monitor is activated. As a result, an active braking procedure is triggered via the inputX2 / Trigger2 of the ACOPOSmulti inverter module.

If the drive, etc. fails, then the K1 auxiliary relay with drop-out time lag is released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the S3 standstill monitor is activated.

Information about SLS and SS2:

The SLS safety function or the SS2 safety function can be implemented depending on the function of the S3 switching device (speed relay or standstill monitor).

Danger!

The S1 and S2 switches displayed require the use of a one-pin switching device with the category 3 / SIL 2 / PL d with positive opening contact according to EN 60947-5-1. A one-pin switching device with the category 3 / SIL 2 / PL d must be used for the displayed K1 relay and the S3 switching device.

The instructions in the switching device's user documentation must be followed!

SS1, SLS, SS2 - Safety category 3 / SIL 2 / PL d (variant B)

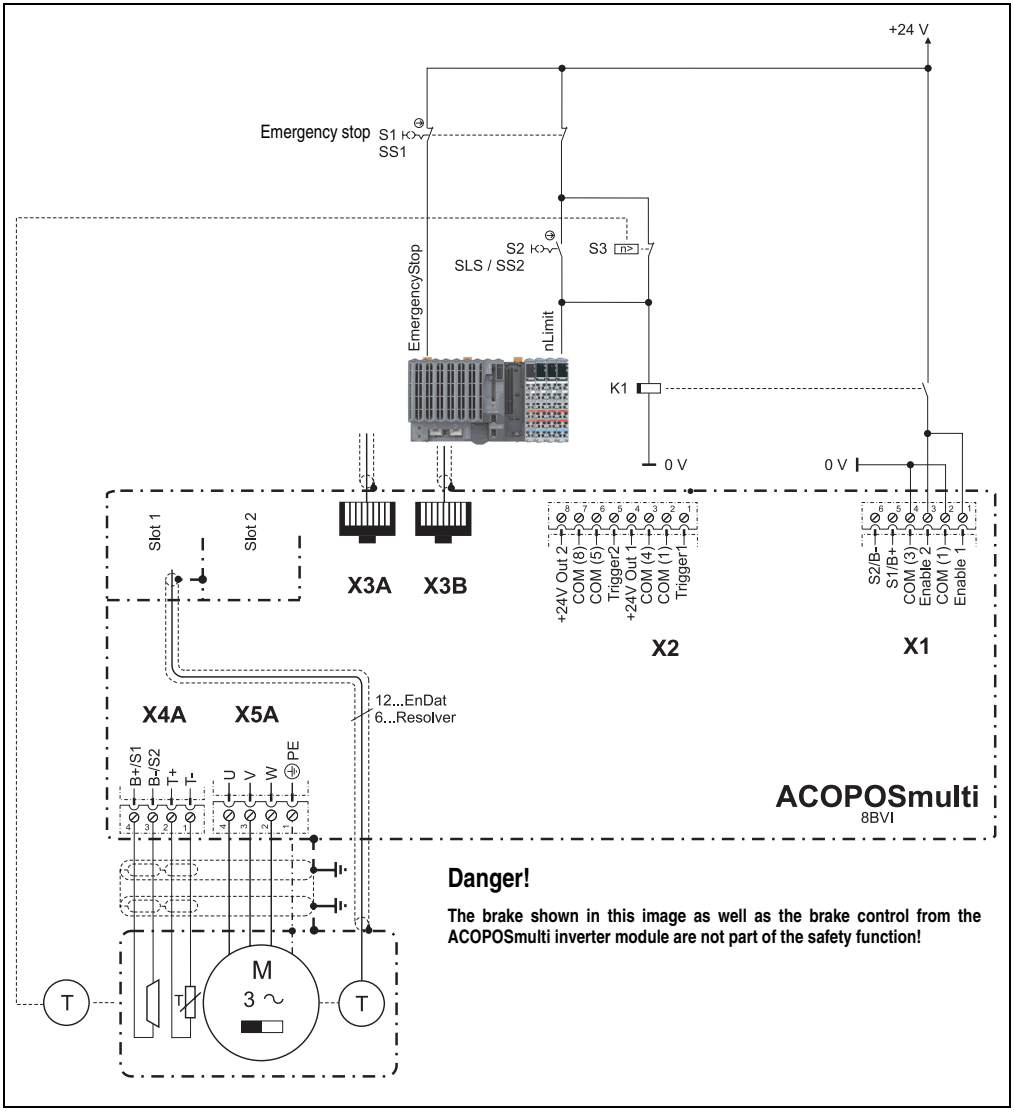


Figure 38: SS1, SLS, SS2 - Safety category 3 / SIL 2 / PL d (variant B)

Description

SS1:

When the e-stop switch S1 is pressed, the "EmergencyStop" digital input on the controller triggers active braking (see "Code Example" on page 165).

If the drive, etc. fails, then the K1 auxiliary relay with drop-out time lag is released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time.

Secure restart inhibit:

If you open and lock E-stop switch S1, unexpected startup is prevented.

SLS:

The SLS safety function is activated by opening the S2 switch. If the limit speed set on the speed relay S3 is exceeded, the speed relay S3 opens and the "nLimit" digital input on the controller triggers active braking (see "Code Example" on page 165).

If the drive, etc. fails, then the K1 auxiliary relay with drop-out time lag is released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the limit speed set on the S3 speed relay is exceeded.

SS2:

The SS2 safety function is activated by opening the S2 switch. An active braking procedure is triggered via the digital input "nLimit" on the controller when the S3 standstill monitor is activated (see "Code Example" on page 165).

If the drive, etc. fails, then the K1 auxiliary relay with drop-out time lag is released after a defined amount of time. Both Enable inputs on the ACOPOSmulti inverter module are separated. As a result, the energy feed to the motor is cut off.

This guarantees that the energy feed to the motor is cut off after a defined amount of time when the S3 standstill monitor is activated.

Information about SLS and SS2:

The SLS safety function or the SS2 safety function can be implemented depending on the function of the S3 switching device (speed relay or standstill monitor).

Danger!

The S1 and S2 switches displayed require the use of two and one-pin switching devices with the category 3 / SIL 2 / PL d with positive opening contact according to EN 60947-5-1. A one-pin switching device with the category 3 / SIL 2 / PL d must be used for the displayed K1 relay and the S3 switching device.

The instructions in the switching device's user documentation must be followed!

Code Example

Trigger the stop command (via CAN bus or Ethernet POWERLINK).

```
if ( ! stop_active )
{
/* Movement stop not active: Test stop inputs */
    if ( EmergencyStop == ncLOW )
    {
    /* Activate movement stop with parameter set for "emergency stop" */
       stop_index = E_STOP_INDEX;
       step = MOV_STOP;
       stop_active = 1;
    }
    else if ( nLimit == ncLOW )
    {
    /* Activate movement stop with parameter set for "low speed" */

       stop_index = NLIMIT_INDEX;
       step = MOV_STOP;
       stop_active = 1;
    }
}
else
{
/* Movement stop was activated */
    if ( EmergencyStop == ncHIGH && nLimit == ncHIGH
          && step!= W_MOVE_STOP )
    {
    /* Movement stop completed */
       stop_active = 0;
    }
}
```

```
switch(step)
{
    ...
    case MOV_STOP:
    /* Call NC action for movement stop */
        p_ax_dat->move.stop.index.command = stop_index;

        action_status = ncaction(ax_obj,ncMOVE,ncSTOP);
        if ( action_status == ncOK )
        {
            step = W_MOVE_STOP;
        }
        break;

    case W_MOVE_STOP:
    /* Wait for completion of movement stop */
        if (p_ax_dat->move.mode == ncOFF)
        {
        /* Movement stop completed */
            step = <NEXT_STEP>
        }
        break;
    ...
}
```

1.4 Overview of the terminal cross sections

1.4.1 8BVF line filter

Connection	Wire Types Approbation Data	8BVF0110		8BVF0440		8BVF0880	
		[mm²]	[AWG]	[mm²]	[AWG]	[mm²]	[AWG]
X1	Solid core / multiple conductor lines	0,2 - 10	24 - 14	0,75 - 16	20 - 6	16 - 50	6 - 0
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 6 0,2 - 6	 24 - 14 24 - 10	 0,75 - 16 0,5 - 16	 20 - 6 18 - 6	 16 - 50 10 - 50	 6 - 0 8 - 0
	Approbation Data UL/C-UL-US CSA	 --- ---	 24 - 10 ---	 --- ---	 20 - 6 ---	 --- ---	 6 - 1/0 ---
Holding Torque for the Terminal Screws [Nm]		Min. 0.7		Min. 1.5		Min. 6	
X2	Solid core / multiple conductor lines	0,2 - 10	24 - 8	0,75 - 16	20 - 6	16 - 50	6 - 0
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 6 0,2 - 6	 24 - 10 24 - 10	 0,75 - 16 0,5 - 16	 20 - 6 18 - 6	 16 - 50 10 - 50	 6 - 0 8 - 0
	Approbation data UL/C-UL-US CSA	 --- ---	 24 - 10 ---	 --- ---	 20 - 6 ---	 --- ---	 6 - 1/0 ---
Holding Torque for the Terminal Screws [Nm]		Min. 0.7		Min. 1.5		Min. 6	
X3	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 28 - 12	 --- ---	 30 - 12 28 - 12	 --- ---	 30 - 12 28 - 12
Holding Torque for the Terminal Screws [Nm]		Min. 0.5		Min. 0.5		Min. 0.5	

Table 70: Terminal cross sections of the 8BVF line filter

1.4.2 8BVR regeneration chokes

Connection	Wire Types Approbation Data	8BVR0110H000.100-1		8BVR0440H000.100-1		8BVR0880H000.100-1	
		[mm²]	[AWG]	[mm²]	[AWG]	[mm²]	[AWG]
U1, V1, W1 U2, V2, W2	Solid core / multiple conductor lines	In preparation	In preparation	1,5 - 25	14 - 2	2,5 - 50	12 - 1/0
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves			 1,5 - 25 1,5 - 16	 14 - 2 14 - 4	 2,5 - 35 2,5 - 35	 12 - 1 12 - 1
	Approbation Data UL/C-UL-US CSA			 --- ---	 18 - 4 14 - 6	 --- ---	 12 - 1 12 - 2
Holding Torque for the Terminal Screws [Nm]		In preparation		2 ... 4		4 ... 5	
T+, T-	Solid core / multiple conductor lines	In preparation	In preparation	0,5- 4	18 - 10	0,5- 4	18 - 10
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves			 0,5 - 4 0,5 - 2,5	 18 - 10 18 - 12	 0,5 - 4 0,5 - 2,5	 18 - 10 18 - 12
	Approbation data UL/C-UL-US CSA			 --- ---	 30 - 12 26 - 12	 --- ---	 30 - 12 26 - 12
Holding Torque for the Terminal Screws [Nm]		In preparation		0,4 ... 0,6		0,4 ... 0,6	

Table 71: Terminal cross sections of the 8BVR regeneration chokes

1.4.3 8BVP power supply units

Connection	Wire Types Approbation Data	8BVP0110		8BVP0440		8BVP0880	
		[mm²]	[AWG]	[mm²]	[AWG]	[mm²]	[AWG]
X1	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5		Min. 0.5		Min. 0.5	
X2	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5		Min. 0.5		Min. 0.5	
X4	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 28 - 12	 --- ---	 30 - 12 28 - 12	 --- ---	 30 - 12 28 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5		Min. 0.5		Min. 0.5	
X5	Solid core / multiple conductor lines	0,2 - 10	24 - 8	0,75 - 16	20 - 6	6 - 50	10 - 0
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 6 0,2 - 6	 24 - 10 24 - 10	 0,75 - 16 0,5 - 16	 20 - 6 18 - 6	 6 - 50 6 - 50	 10 - 0 10 - 0
	Approbation data UL/C-UL-US CSA	 --- ---	 24 - 10 ---	 --- ---	 20 - 6 ---	 --- ---	 In preparation In preparation
Holding torque for the terminal screws [Nm]		Min. 0.7		Min. 1.5		--- 1)	

Table 72: Terminal cross sections of the 8BVP power supply units

1) The connection is made with cable lugs using an M8 threaded bolt.

1.4.4 8B0C auxiliary supply modules

Connection	Wire types Approbation data	8B0C0160 8B0C0320	
		[mm²]	[AWG]
X1	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 22 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5	
X2 1)	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 22 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5	
X3 1)	Solid core / multiple conductor lines	0,2 - 10	24 - 8
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 6 0,2 - 6	 24 - 10 24 - 10
	Approbation data UL/C-UL-US CSA	 --- ---	 24 - 10 ---
Holding torque for the terminal screws [Nm]		Min. 0.7	

Table 73: Terminal cross sections of the 8B0C auxiliary supply modules

1) Only for 8B0C0160Hx00.001-1, 8B0C0160HC00.A01-1 and 8B0C0320Hx00.002-1.

1.4.5 8BVI inverter modules

Connection	Wire types Approbation data	8BVI0014 8BVI0028 8BVI0055 8BVI0110		8BVI0220 8BVI0440		8BVI0880	
		[mm²]	[AWG]	[mm²]	[AWG]	[mm²]	[AWG]
X1	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5		Min. 0.5		Min. 0.5	
X2	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12	 --- ---	 30 - 12 22 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5		Min. 0.5		Min. 0.5	
X4A, X4B	Solid core / multiple conductor lines	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12	0,2 - 2,5	24 - 12
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12	 0,2 - 2,5 0,25 - 2,5	 24 - 12 24 - 12
	Approbation data UL/C-UL-US CSA	 --- ---	 30 - 12 28 - 12	 --- ---	 30 - 12 28 - 12	 --- ---	 30 - 12 28 - 12
Holding torque for the terminal screws [Nm]		Min. 0.5		Min. 0.5		Min. 0.5	
X5A, X5B	Solid core / multiple conductor lines	0,2 - 10	24 - 8	0,75 - 16	20 - 6	6 - 50	10 - 0
	Flexible and fine wire lines without Wire Tip Sleeves with Wire Tip Sleeves	 0,2 - 6 0,2 - 6	 24 - 10 24 - 10	 0,75 - 16 0,5 - 16	 20 - 6 18 - 6	 6 - 50 6 - 50	 10 - 0 10 - 0
	Approbation data UL/C-UL-US CSA	 --- ---	 24 - 10 ---	 --- ---	 20 - 6 ---	 --- ---	 In preparation In preparation
Holding torque for the terminal screws [Nm]		Min. 0.7		Min. 1.5		--- 1)	

Table 74: Terminal cross sections of the 8BVI inverter modules

1) The connection is made with cable lugs using an M8 threaded bolt.

2. Line filter 8BVF

2.1 8BVF0440H000.001-2

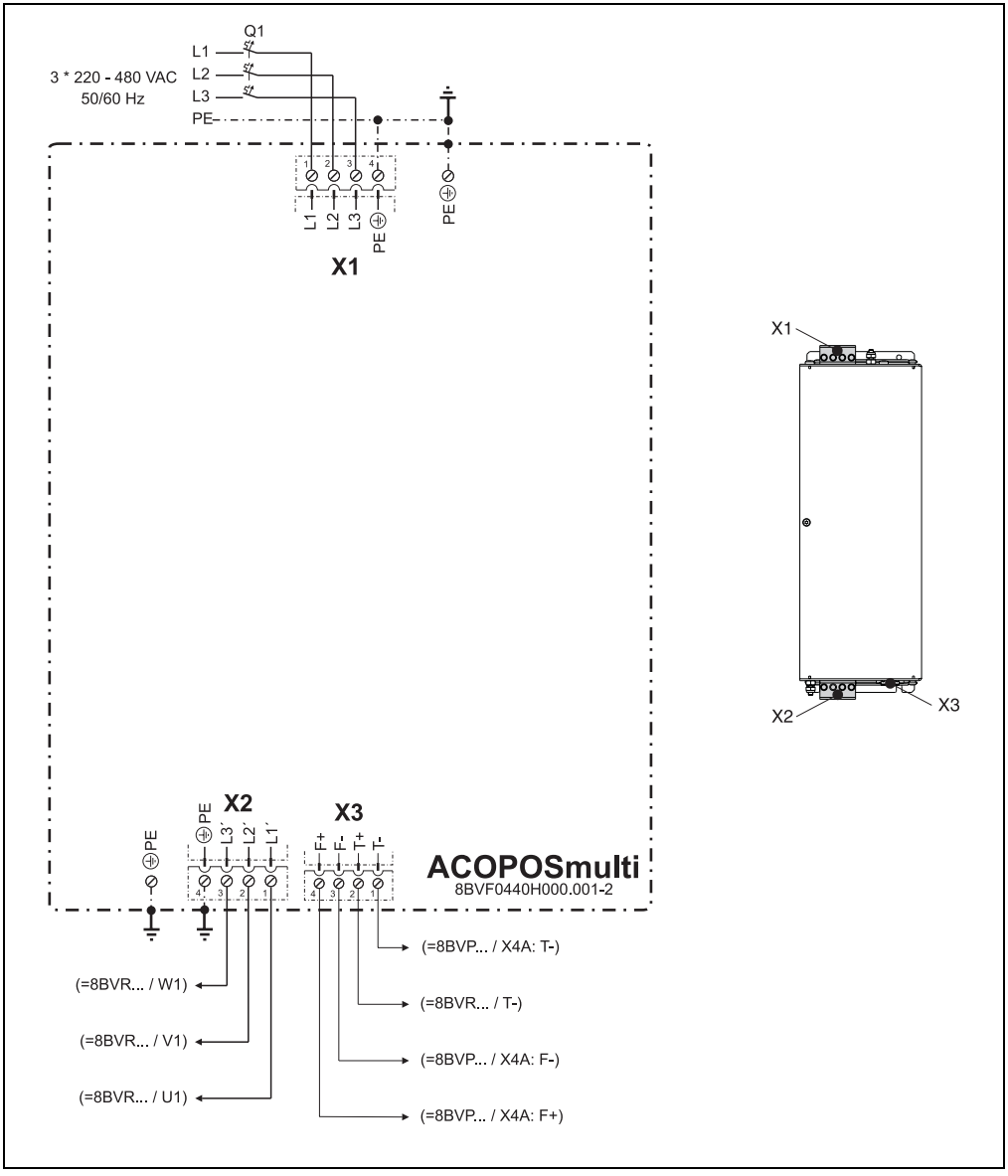


Figure 39: Overview of pin assignments - 8BVF0440H000.001-2

2.1.1 Pin assignments - X1 plug

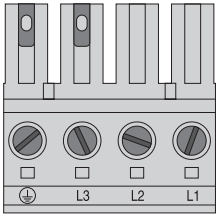
X1	Name	Function
	L1	Power mains connection L1 (mains side)
	L2	Power mains connection L2 (mains side)
	L3	Power mains connection L3 (mains side)
	PU	Protective ground conductor

Table 75: Pin assignments - X1 plug 8BVF0440H000.001-2

2.1.2 Pin assignments - X2 plug

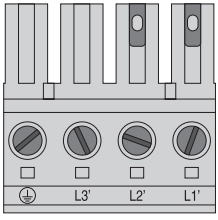
X2	Name	Function
	L1'	Power mains connection L1 (load side)
	L2'	Power mains connection L2 (load side)
	L3'	Power mains connection L3 (load side)
	PU	Protective ground conductor

Table 76: Pin assignments - X2 plug 8BVF0440H000.001-2

2.1.3 Pin assignments - X3 plug

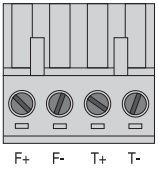
X3	Name	Function
	T-	Load: Temperature sensor -
	T+	Load: Temperature sensor +
	F-	Load: Fans -
	F+	Load: Fans +

Table 77: Pin assignments - X3 plug 8BVF0440H000.001-2

2.1.4 Protective Ground Connection (PE) (mains and load side)

The protective ground conductor is connected to the threaded bolt M5 provided using a cable lug. For information concerning dimensioning see section 1.1.3 "Protective Ground Connection (PE)" on page 118.

Image	Pin	Name	Function
	---	PU	Protective ground conductor

Terminal cross sections	[mm²]	AWG
Cable lug for threaded bolt M5	0.25 - 16	23 - 5

Table 78: Protective ground connection (PE) - 8BVF0440H000.001-2

Danger!

Before turning on the supply voltage, make sure that the line filter housing is properly connected to ground (PE rail). The ground connection must be made, even when testing the line filter or when operating it for a short time!

2.2 8BVF0880H000.000-1

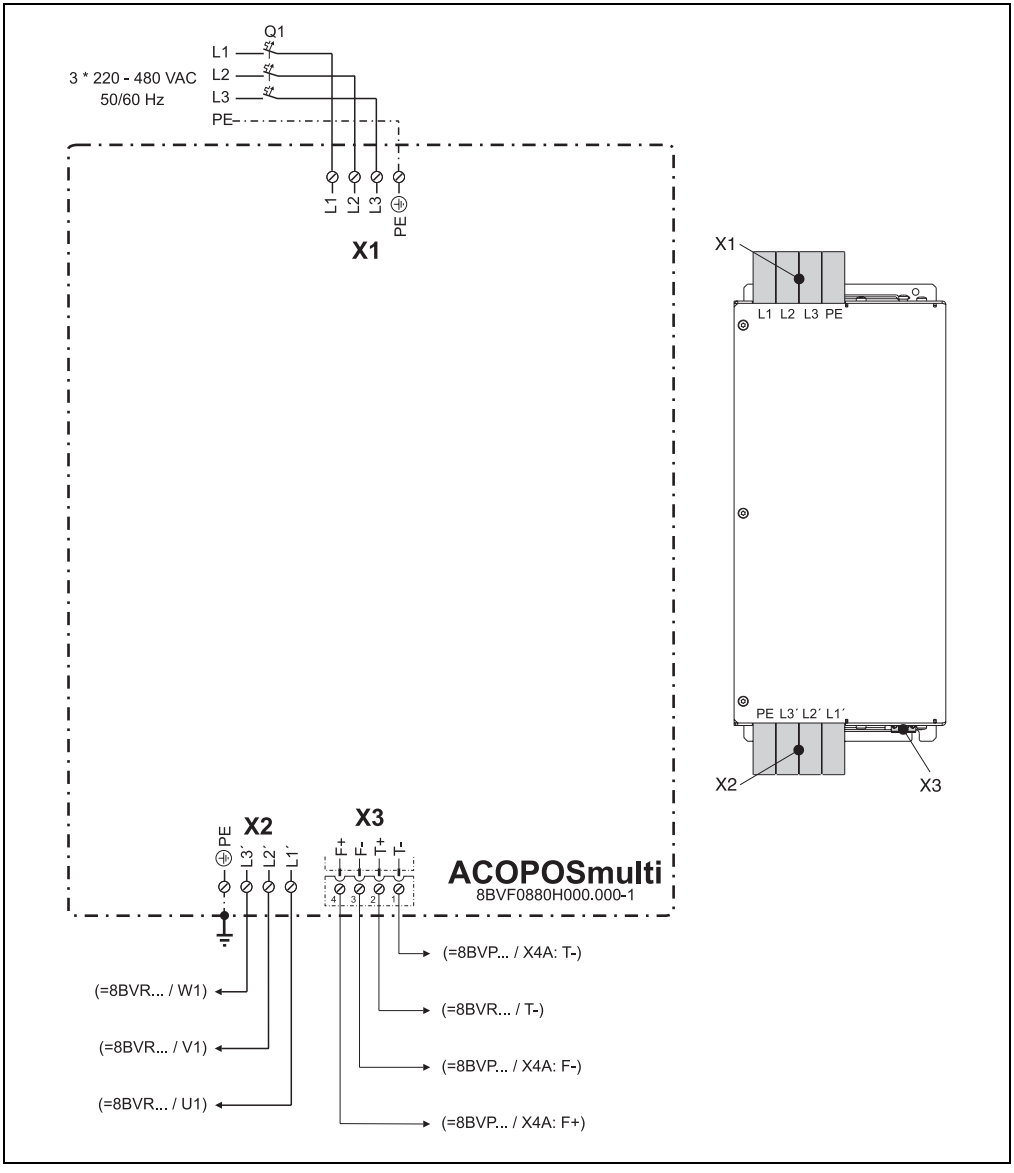


Figure 40: Overview of pin assignments - 8BVF0880H000.000-1

2.2.1 X1 pin assignments

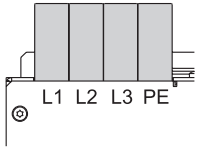
X1	Name	Function
	L1	Power mains connection L1 (mains side)
	L2	Power mains connection L2 (mains side)
	L3	Power mains connection L3 (mains side)
	PU	Protective ground conductor

Table 79: Pin assignments - X1 8BVF0880H000.000-1

2.2.2 Pin assignments X2

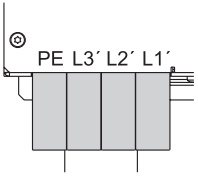
X2	Name	Function
	L1'	Power mains connection L1 (load side)
	L2'	Power mains connection L2 (load side)
	L3'	Power mains connection L3 (load side)
	PU	Protective ground conductor

Table 80: Pin assignments - X2 8BVF0880H000.000-1

2.2.3 Pin assignments - X3 plug

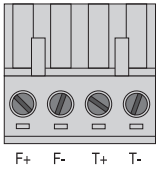
X3	Name	Function
	T-	Load: Temperature sensor -
	T+	Load: Temperature sensor +
	F-	Load: Fans -
	F+	Load: Fans +

Table 81: Pin assignments - X3 plug 8BVF0880H000.000-1

Danger!

Before turning on the supply voltage, make sure that the line filter housing is properly connected to ground (PE rail). The ground connection must be made, even when testing the line filter or when operating it for a short time!

3. 8BVR regeneration chokes

3.1 8BVR0440H000.100-1

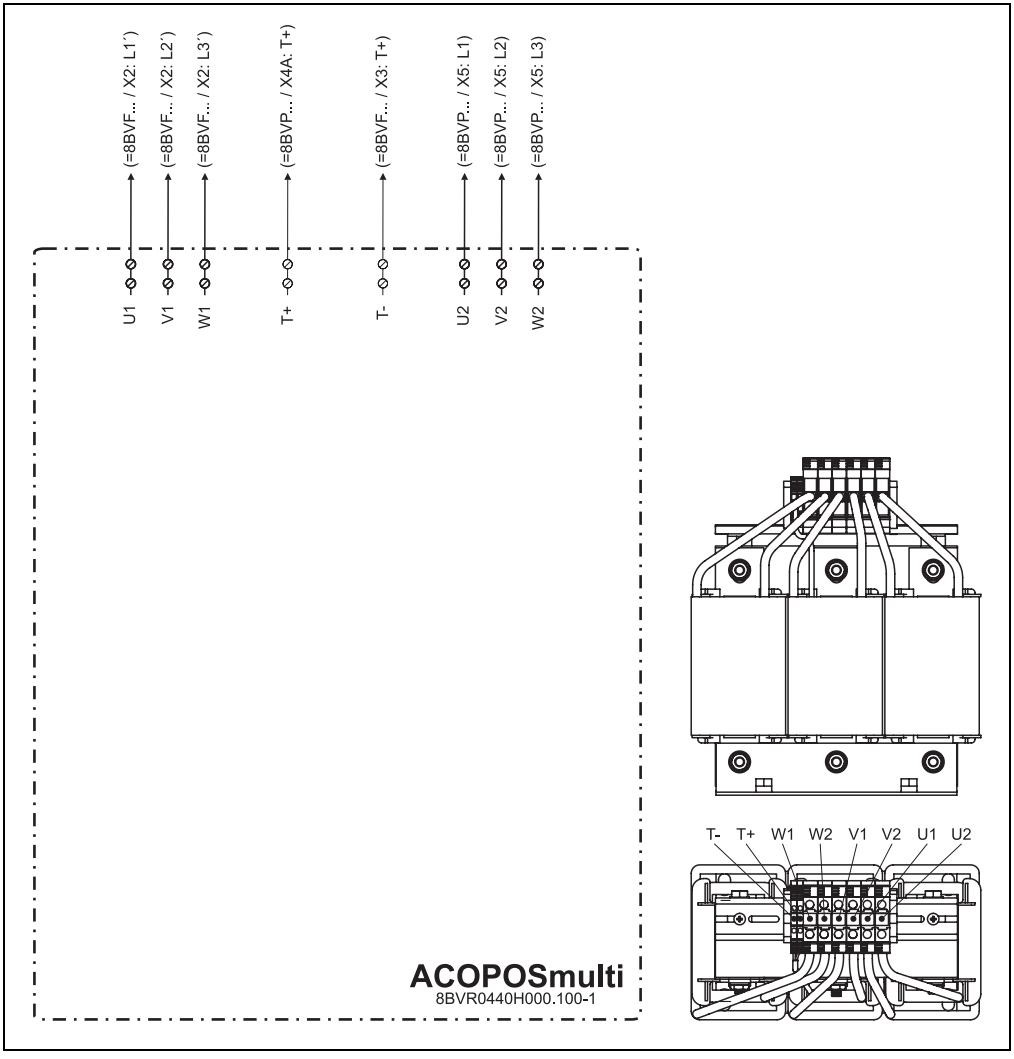


Figure 41: Overview of pin assignments - 8BVR0440H000.100-1

3.2 8BVR0880H000.100-1

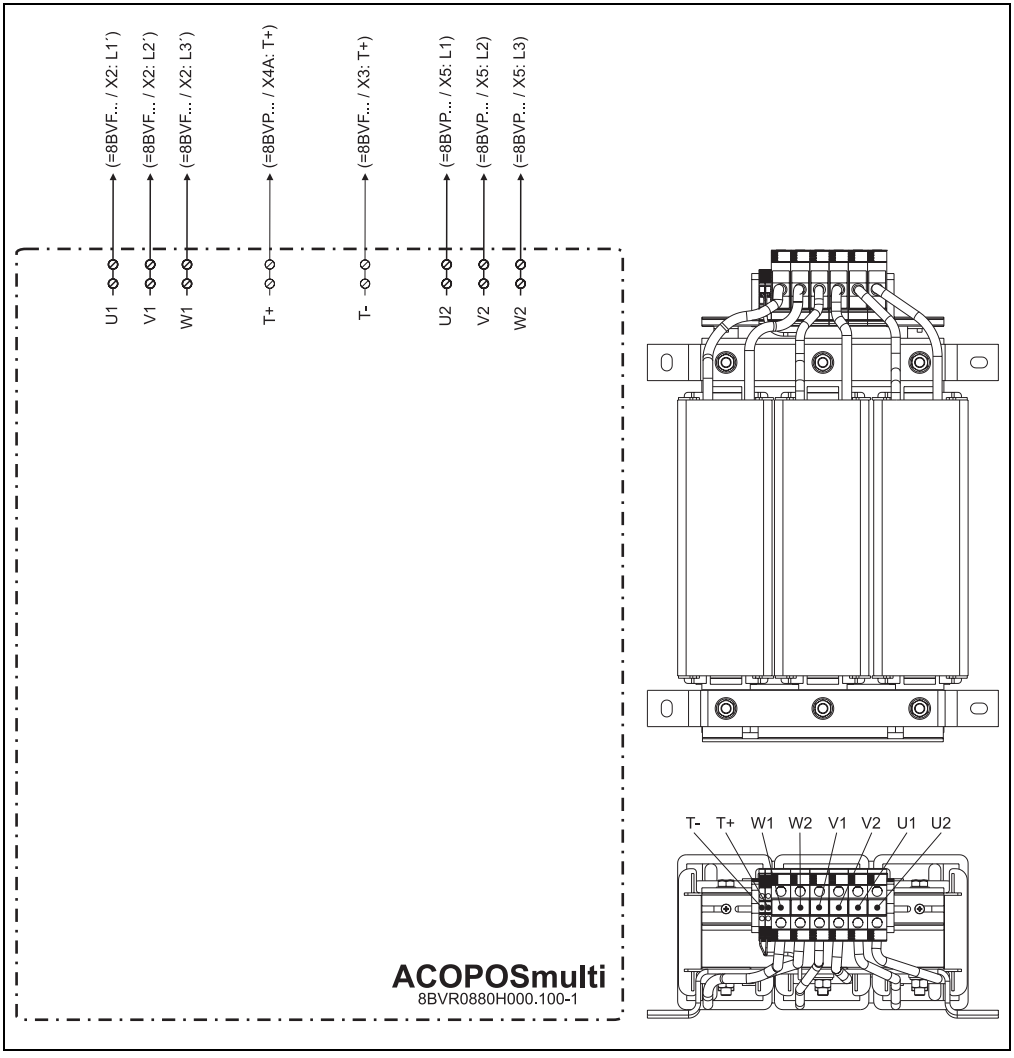


Figure 42: Overview of pin assignments - 8BVR0880H000.100-1

4. 8BVP power supply modules

4.1 8BVP0880Hx00.000-1

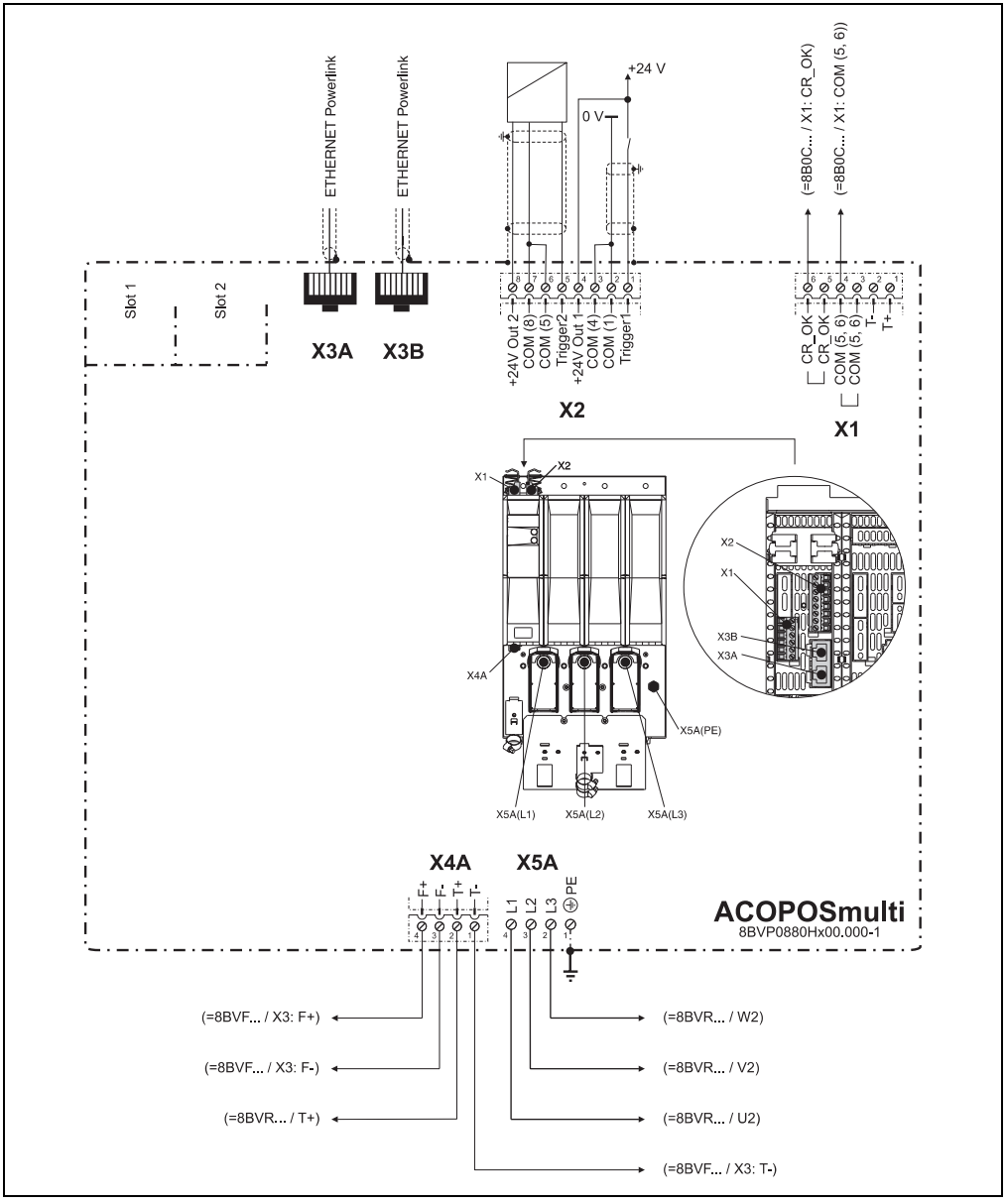


Figure 43: Overview of pin assignments - 8BVP0880Hx00.000-1

4.1.1 Pin assignments - X1 plug

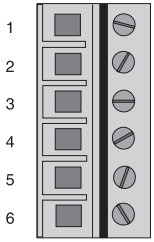
X1	Pin	Name	Function
	1	T+	Temperature sensor +
	2	T-	Temperature sensor -
	3	COM (5, 6)	DC bus ready 0 V
	4	COM (5, 6)	DC bus ready 0 V
	5	CR_OK	DC bus ready
	6	CR_OK	DC bus ready

Table 82: Pin assignments - X1 plug 8BVP0880Hx00.000-1

4.1.2 Pin assignments - X2 plug

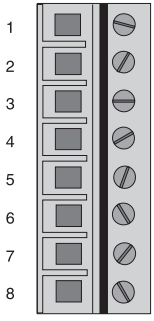
X2	Pin	Name	Function
	1	Trigger1	Trigger 1
	2	COM (1)	Trigger 1 0 V
	3	COM (4)	+24 V output 1 0 V
	4	+24V Out 1	+24 V output 1
	5	Trigger2	Trigger 2
	6	COM (5)	Trigger 2 0 V
	7	COM (8)	+24 V output 2 0 V
	8	+24V Out 2	+24 V output 2

Table 83: Pin assignments - X2 plug 8BVP0880Hx00.000-1

4.1.3 Pin assignments - X3A, X3B plugs

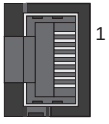
X3A, X3B	Pin	Name	Function
	1	RXD	Receive signal
	2	RXD\	Receive signal inverted
	3	TXD	Transmit signal
	4	Shield	Shield
	5	Shield	Shield
	6	TXD\	Transmit signal inverted
	7	Shield	Shield
	8	Shield	Shield

Table 84: Pin assignments - X3A, X3B plugs 8BVP0880Hx00.000-1

4.1.4 Pin assignments - X4A plug

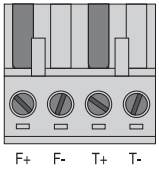
X4A	Name	Function
	T-	Network: Temperature sensor -
	T+	Network: Temperature sensor +
	F-	Network: Fans -
	F+	Network: Fans +

Table 85: Pin assignments - X4A plug 8BVP0880Hx00.000-1

4.1.5 Pin assignments - X5A plug

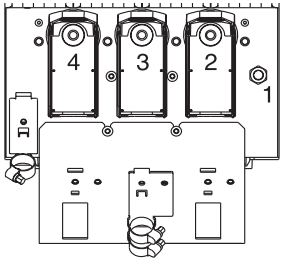
X5A	Pin	Name	Function
	1	PU	Network: Protective ground conductor
	2	L3	Network: Power mains connection L3
	3	L2	Network: Power mains connection L2
	4	L1	Network: Power mains connection L1
	Holding torque for the M8 nuts: 7.5 Nm		

Table 86: Pin assignments - X5A plug 8BVP0880Hx00.000-1

Danger!

Before turning on the module, make sure that the housing is properly connected to ground (PE rail). The ground connection must be made, even when testing the module or when operating it for a short time!

Cable installation for power mains connection L1, L2, L3

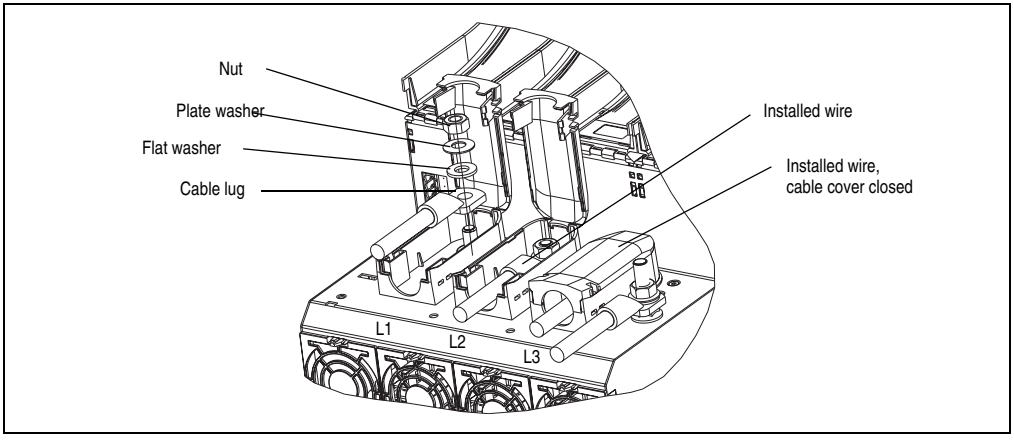


Figure 44: Cable installation for power mains connection L1, L2, L3

Cable installation connection PE (1 wire)

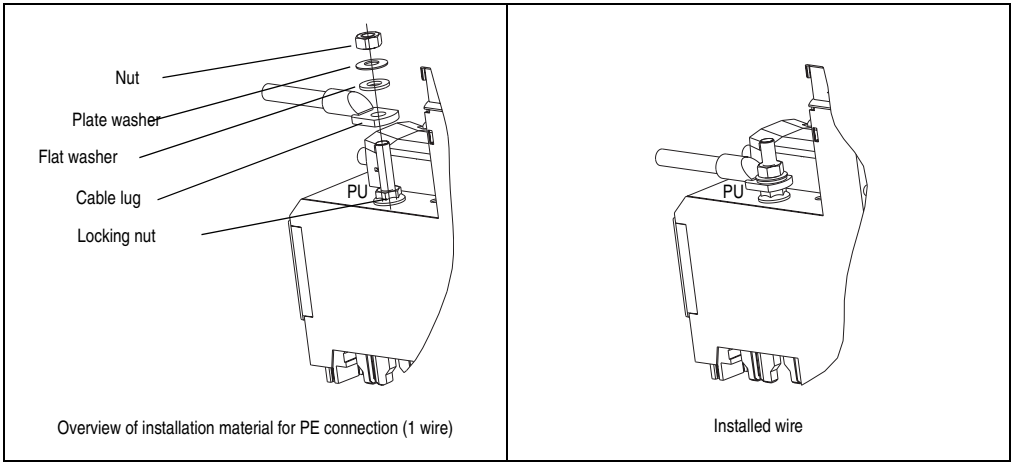


Figure 45: Cable installation connection PE (1 wire)

Cable installation connection PE (3 wire)

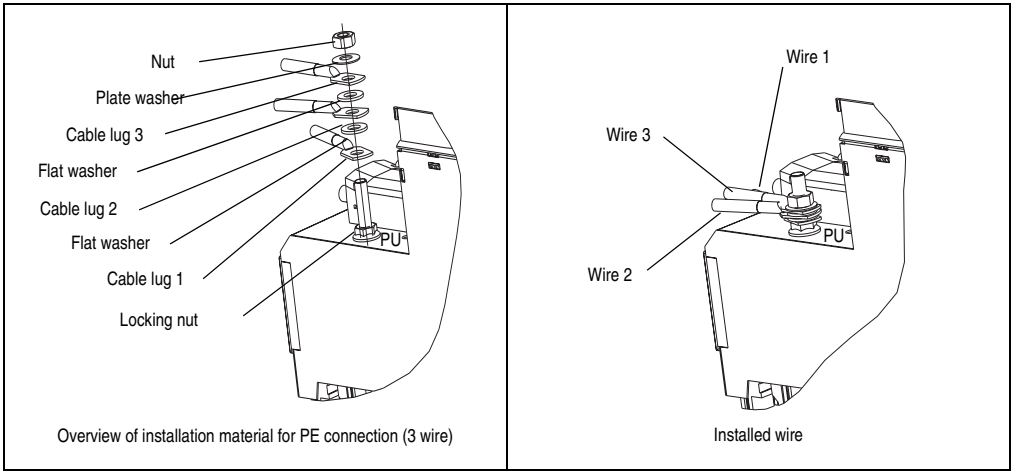


Figure 46: Cable installation connection PE (3 wire)

5. 8B0C auxiliary supply module

5.1 8B0C0160Hx00.000-1

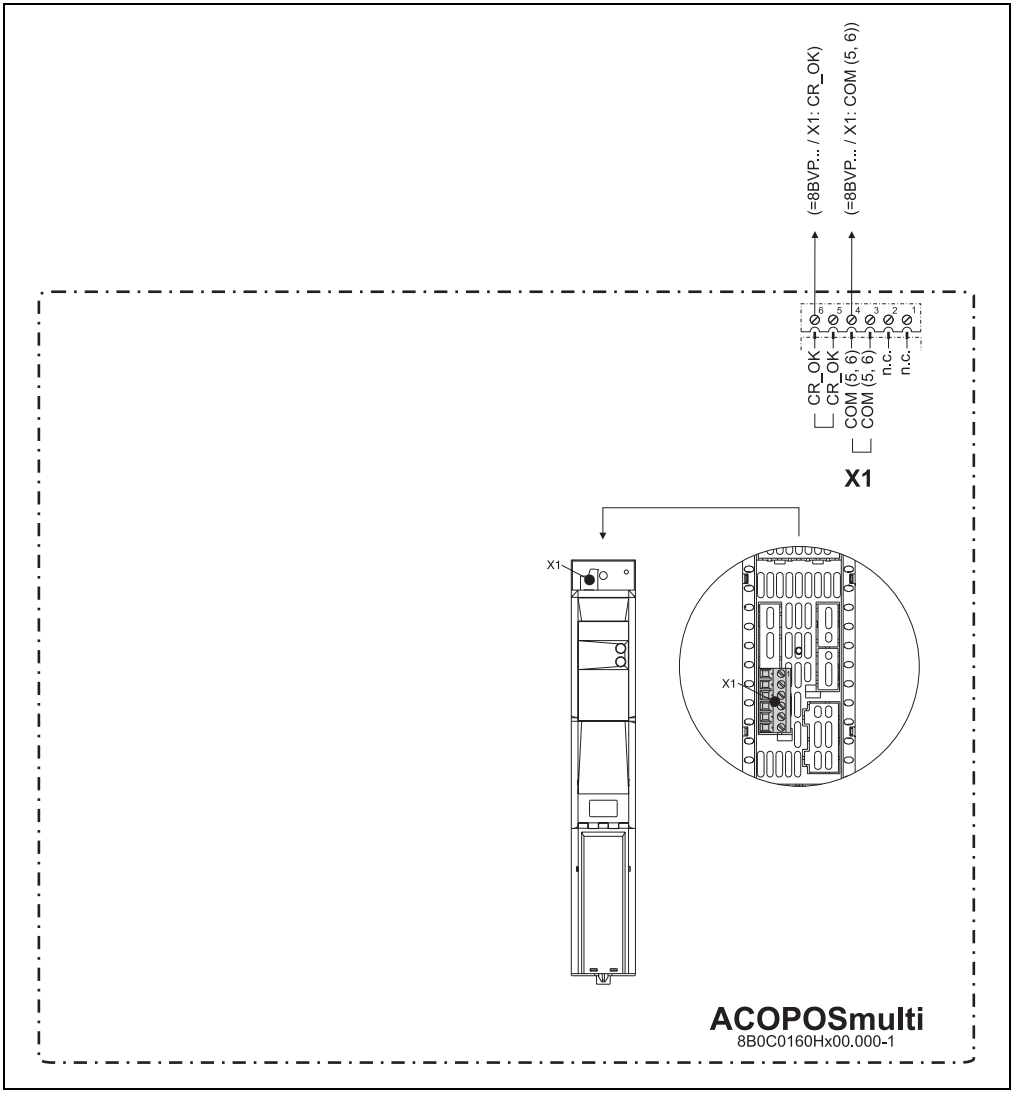


Figure 47: Overview of pin assignments - 8B0C0160Hx00.000-1

5.1.1 Pin assignments - X1 plug

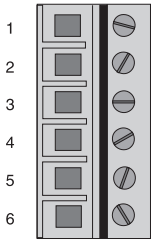
X1	Pin	Name	Function
	1	---	---
	2	---	---
	3	COM (5, 6)	DC bus ready 0 V
	4	COM (5, 6)	DC bus ready 0 V
	5	CR_OK	DC bus ready
	6	CR_OK	DC bus ready

Table 87: Pin assignments for plug X1 8B0C0160Hx00.000-1

5.2 8B0C0160Hx00.001-1

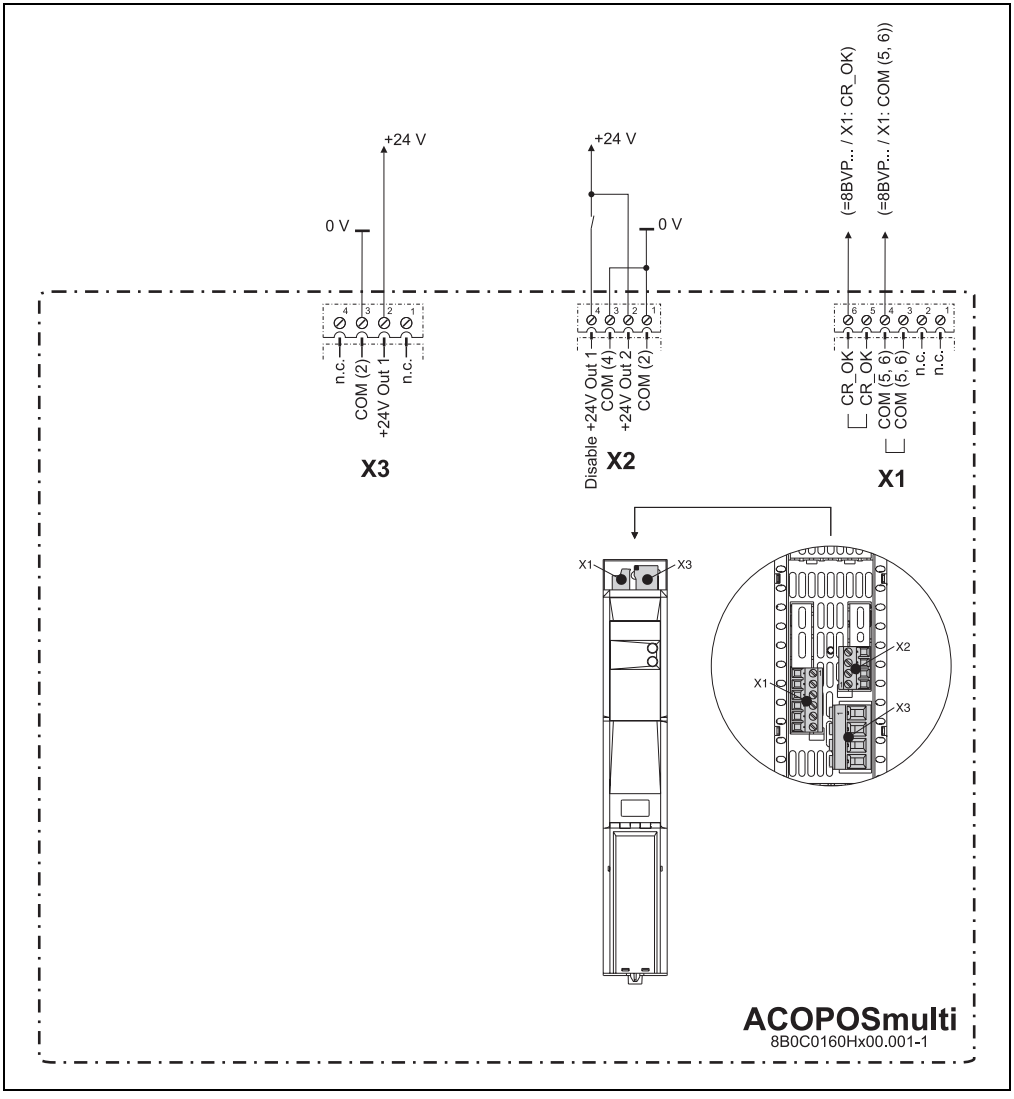


Figure 48: Overview of pin assignments - 8B0C0160Hx00.001-1

5.2.1 Pin assignments - X1 plug

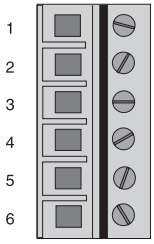
X1	Pin	Name	Function
	1	---	---
	2	---	---
	3	COM (5, 6)	DC bus ready 0 V
	4	COM (5, 6)	DC bus ready 0 V
	5	CR_OK	DC bus ready
	6	CR_OK	DC bus ready

Table 88: Pin assignments - X1 plug 8B0C0160Hx00.001-1

5.2.2 Pin assignments - X2 plug

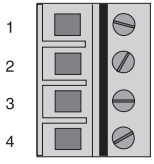
X2	Pin	Name	Function
	1	COM (2)	+24 V output 2 0 V
	2	+24V Out 2	+24 V output 2
	3	COM (4)	Disable +24 V output 1 0 V
	4	Disable +24V Out 1	Disable +24 V output 1

Table 89: Pin assignments - X2 plug 8B0C0160Hx00.001-1

5.2.3 Pin assignments - X3 plug

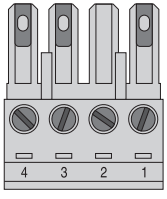
X3	Pin	Name	Function
	1	---	---
	2	+24V Out 1	+24 V output 1
	3	COM (2)	+24 V output 1 0 V
	4	---	---

Table 90: Pin assignments - X3 plug 8B0C0160Hx00.001-1

5.3 8B0C0160HC00.A01-1

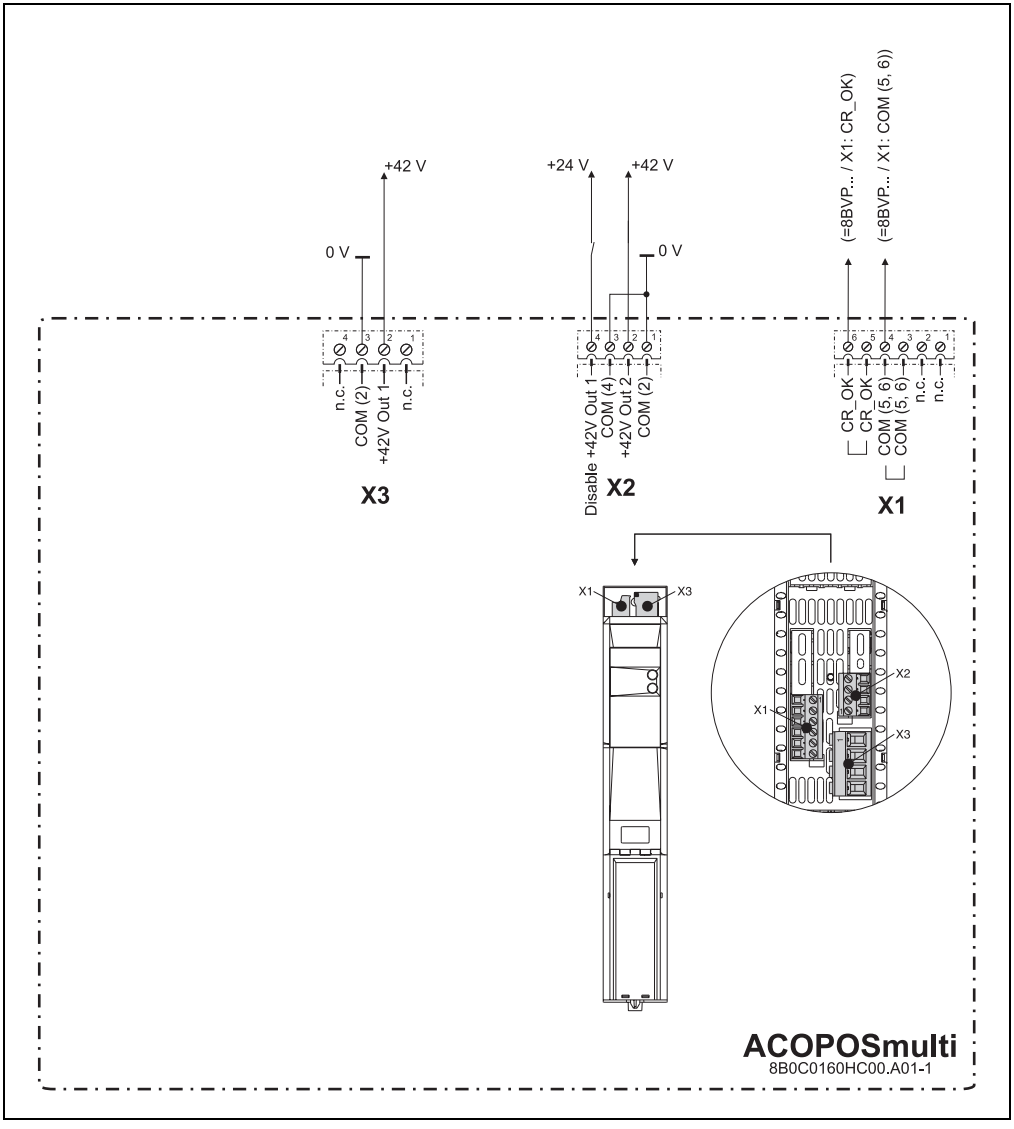


Figure 49: Overview of pin assignments - 8B0C0160HC00.A01-1

5.3.1 Pin assignments - X1 plug

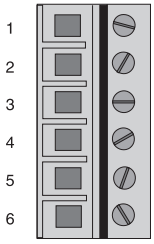
X1	Pin	Name	Function
	1	---	---
	2	---	---
	3	COM (5, 6)	DC bus ready 0 V
	4	COM (5, 6)	DC bus ready 0 V
	5	CR_OK	DC bus ready
	6	CR_OK	DC bus ready

Table 91: Pin assignments - X1 plug 8B0C0160HC00.A01-1

5.3.2 Pin assignments - X2 plug

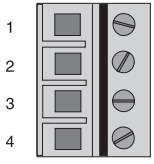
X2	Pin	Name	Function
	1	COM (2)	+42 V output 2 0 V
	2	+42V Out 2	+42 V output 2
	3	COM (4)	Disable +42 V output 1 0 V
	4	Disable +42V Out 1	Disable +42 V output 1

Table 92: Pin assignments - X2 plug 8B0C0160HC00.A01-1

5.3.3 Pin assignments - X3 plug

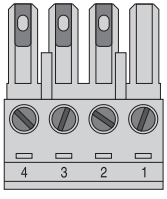
X3	Pin	Name	Function
	1	---	---
	2	+42V Out 1	+42 V output 1
	3	COM (2)	+42 V output 1 0 V
	4	---	---

Table 93: Pin assignments - X3 plug 8B0C0160HC00.A01-1

5.4 8B0C0320Hx00.000-1

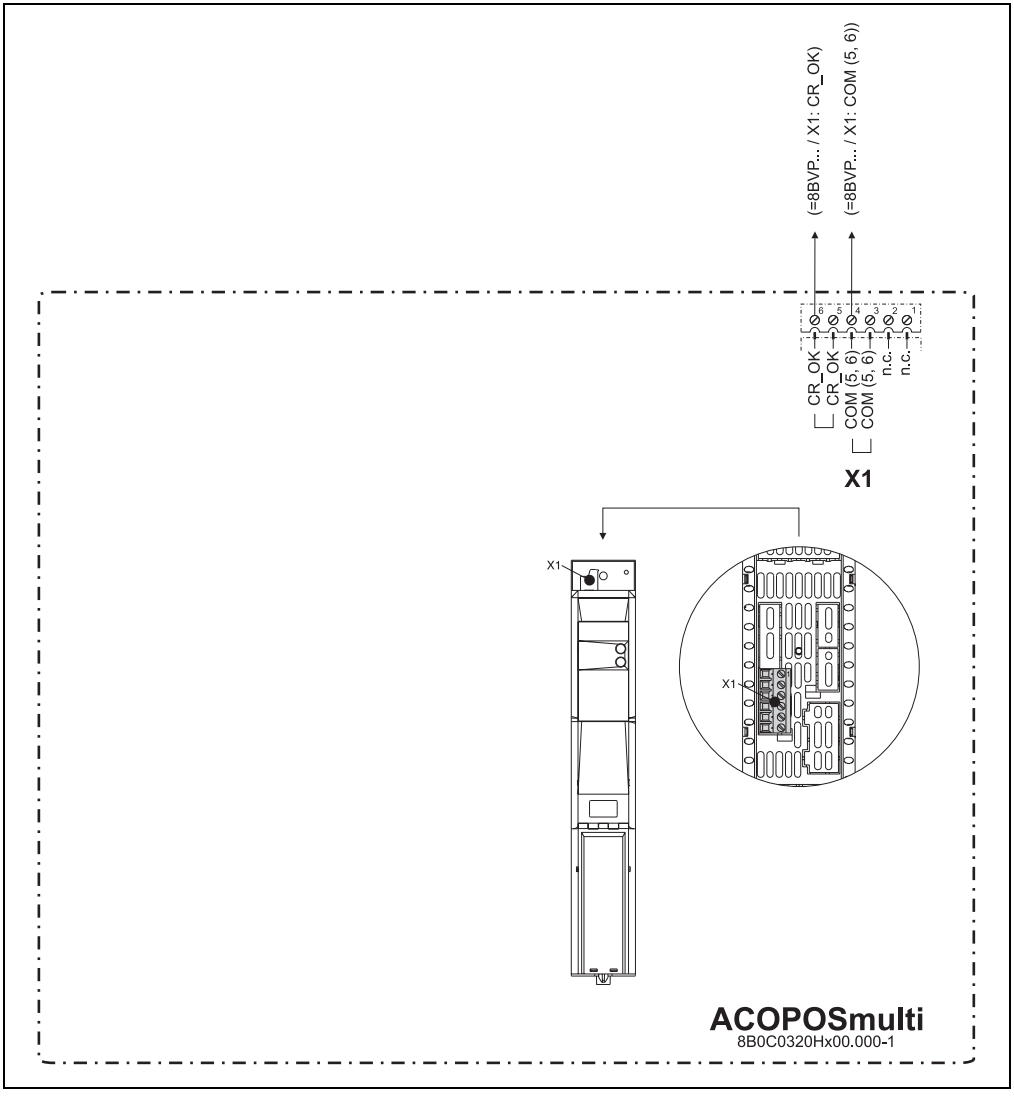


Figure 50: Overview of pin assignments - 8B0C0320Hx00.000-1

5.4.1 Pin assignments - X1 plug

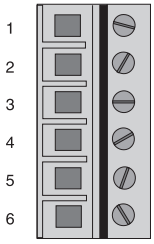
X1	Pin	Name	Function
	1	---	---
	2	---	---
	3	COM (5, 6)	DC bus ready 0 V
	4	COM (5, 6)	DC bus ready 0 V
	5	CR_OK	DC bus ready
	6	CR_OK	DC bus ready

Table 94: Pin assignments - X1 plug 8B0C0320Hx00.000-1

5.5 8B0C0320Hx00.002-1

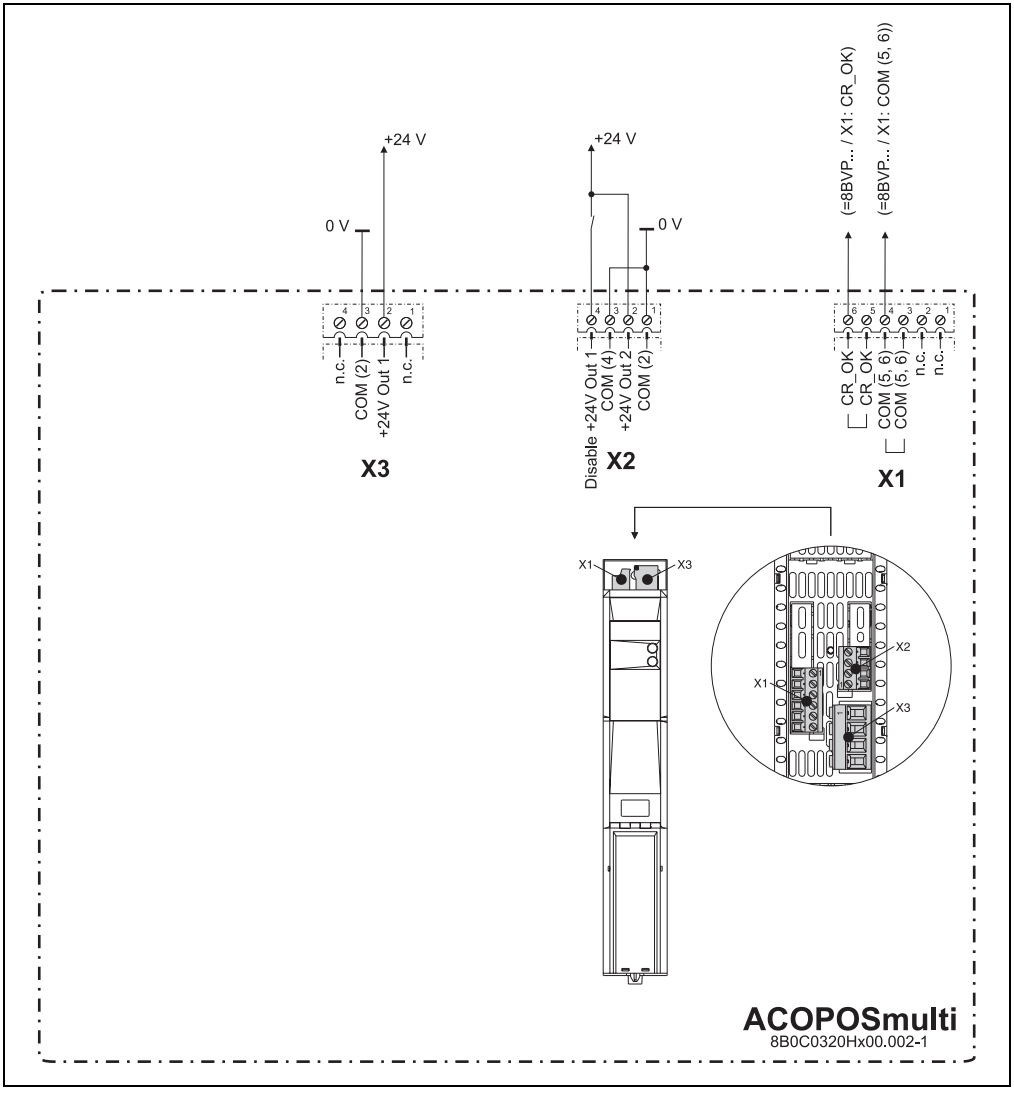


Figure 51: Overview of pin assignments - 8B0C0320Hx00.002-1

5.5.1 Pin assignments - X1 plug

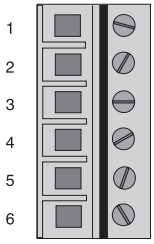
X1	Pin	Name	Function
	1	---	---
	2	---	---
	3	COM (5, 6)	DC bus ready 0 V
	4	COM (5, 6)	DC bus ready 0 V
	5	CR_OK	DC bus ready
	6	CR_OK	DC bus ready

Table 95: Pin assignments - X1 plug 8B0C0320Hx00.002-1

5.5.2 Pin assignments - X2 plug

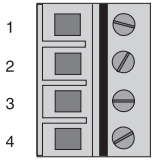
X2	Pin	Name	Function
	1	COM (2)	+24 V output 2 0 V
	2	+24V Out 2	+24 V output 2
	3	COM (4)	Disable +24 V output 1 0 V
	4	Disable +24V Out 1	Disable +24 V output 1

Table 96: Pin assignments - X2 plug 8B0C0320Hx00.002-1

5.5.3 Pin assignments - X3 plug

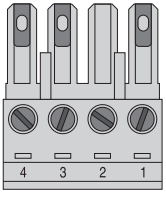
X3	Pin	Name	Function
	1	---	---
	2	+24V Out 1	+24 V output 1
	3	COM (2)	+24 V output 1 0 V
	4	---	---

Table 97: Pin assignments - X3 plug 8B0C0320Hx00.002-1

6. 8BVI inverter modules

6.1 8BVI0055HxS0.000-1

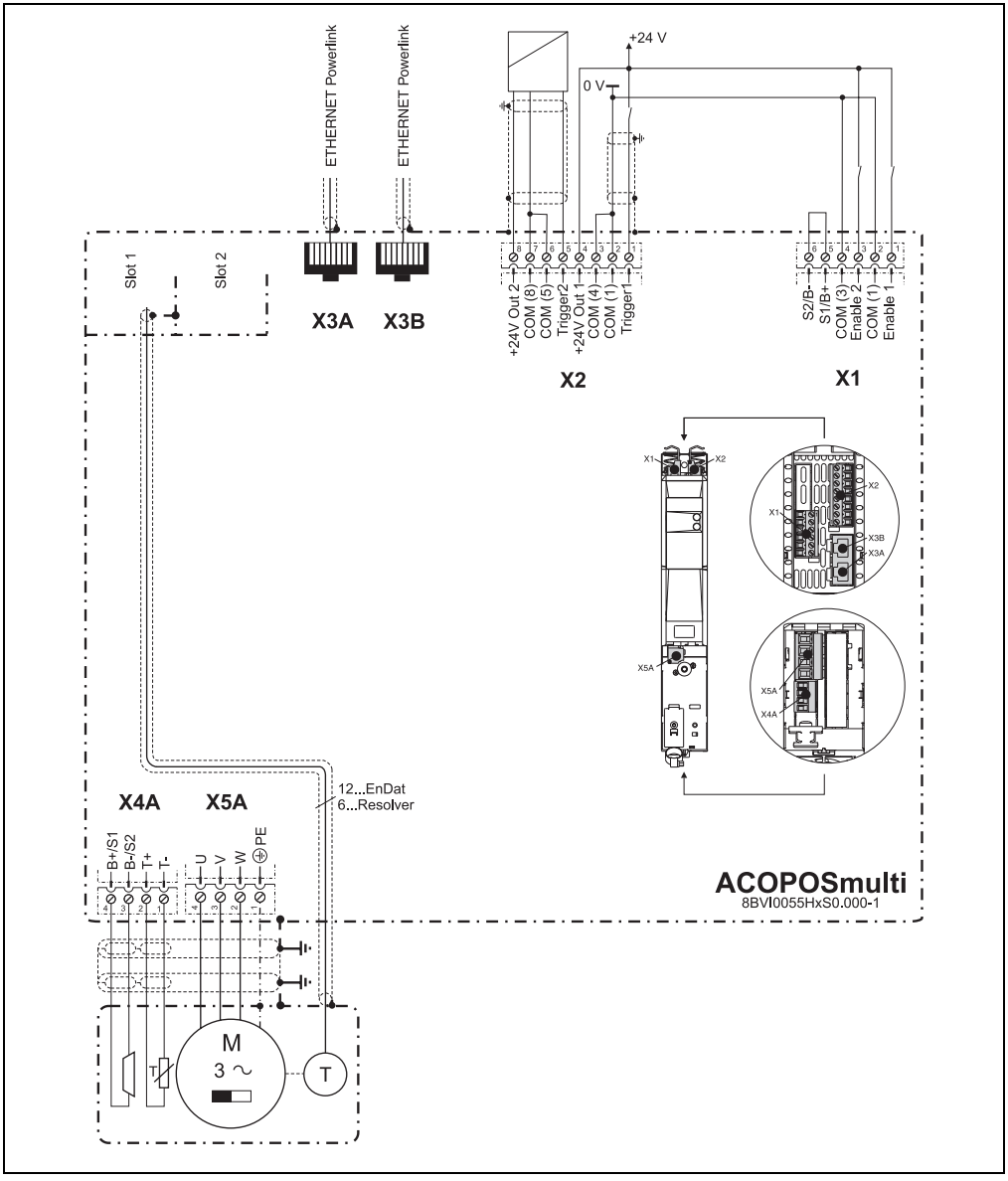


Figure 52: Overview of pin assignments - 8BVI0055HxS0.000-1

6.1.1 Pin assignments - X1 plug

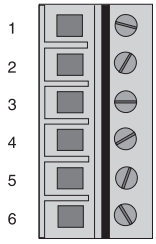
X1	Pin	Name	Function
	1	Enable 1	Axis 1: Enable 1
	2	COM (1)	Axis 1: Enable 1 0 V
	3	Enable 2	Axis 1: Enable 2
	4	COM (3)	Axis 1: Enable 2 0 V
	5	S1/B+	Axis 1: Brake + / Activation for the external holding brake
	6	S2/B-	Axis 1: Brake - / Activation for the external holding brake

Table 98: Pin assignments - X1 plug 8BVI0055HxS0.000-1

6.1.2 Pin assignments - X2 plug

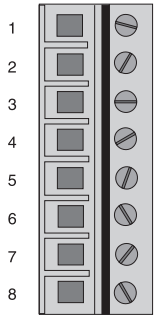
X2	Pin	Name	Function
	1	Quickstop/Trigger1	Quickstop/Trigger 1
	2	COM (1)	Quickstop/Trigger 1 0 V
	3	COM (4)	+24 V output 1 0 V
	4	+24 V Out 1	+24 V output 1
	5	Quickstop/Trigger2	Quickstop/Trigger 2
	6	COM (5)	Quickstop/Trigger 2 0 V
	7	COM (8)	+24 V output 2 0 V
	8	+24 V Out 2	+24 V output 2

Table 99: Pin assignments - X2 plug 8BVI0055HxS0.000-1

6.1.3 Pin assignments - X3A, X3B plugs

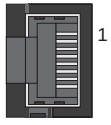
X3A, X3B	Pin	Name	Function
	1	RXD	Receive signal
	2	RXD\	Receive signal inverted
	3	TXD	Transmit signal
	4	Shield	Shield
	5	Shield	Shield
	6	TXD\	Transmit signal inverted
	7	Shield	Shield
	8	Shield	Shield

Table 100: Pin assignments - X3A, X3B plugs 8BVI0055HxS0.000-1

6.1.4 Pin assignments - X4A plug

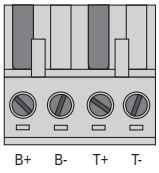
X4A	Name	Function
	T-	Axis 1: Temperature sensor -
	T+	Axis 1: Temperature sensor +
	B-/S2	Axis 1: Brake - / Activation for the external holding brake
	B+/S1	Axis 1: Brake + / Activation for the external holding brake

Table 101: Pin assignments - X4A plug 8BVI0055HxS0.000-1

6.1.5 Pin assignments - X5A plug

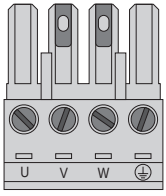
X5A	Name	Function
	PU	Axis 1: Protective ground conductor
	W	Axis 1: Motor connection W
	V	Axis 1: Motor connection V
	U	Axis 1: Motor connection U

Table 102: Pin assignments - X5A plug 8BVI0055HxS0.000-1

6.2 8BVI0055HxD0.000-1

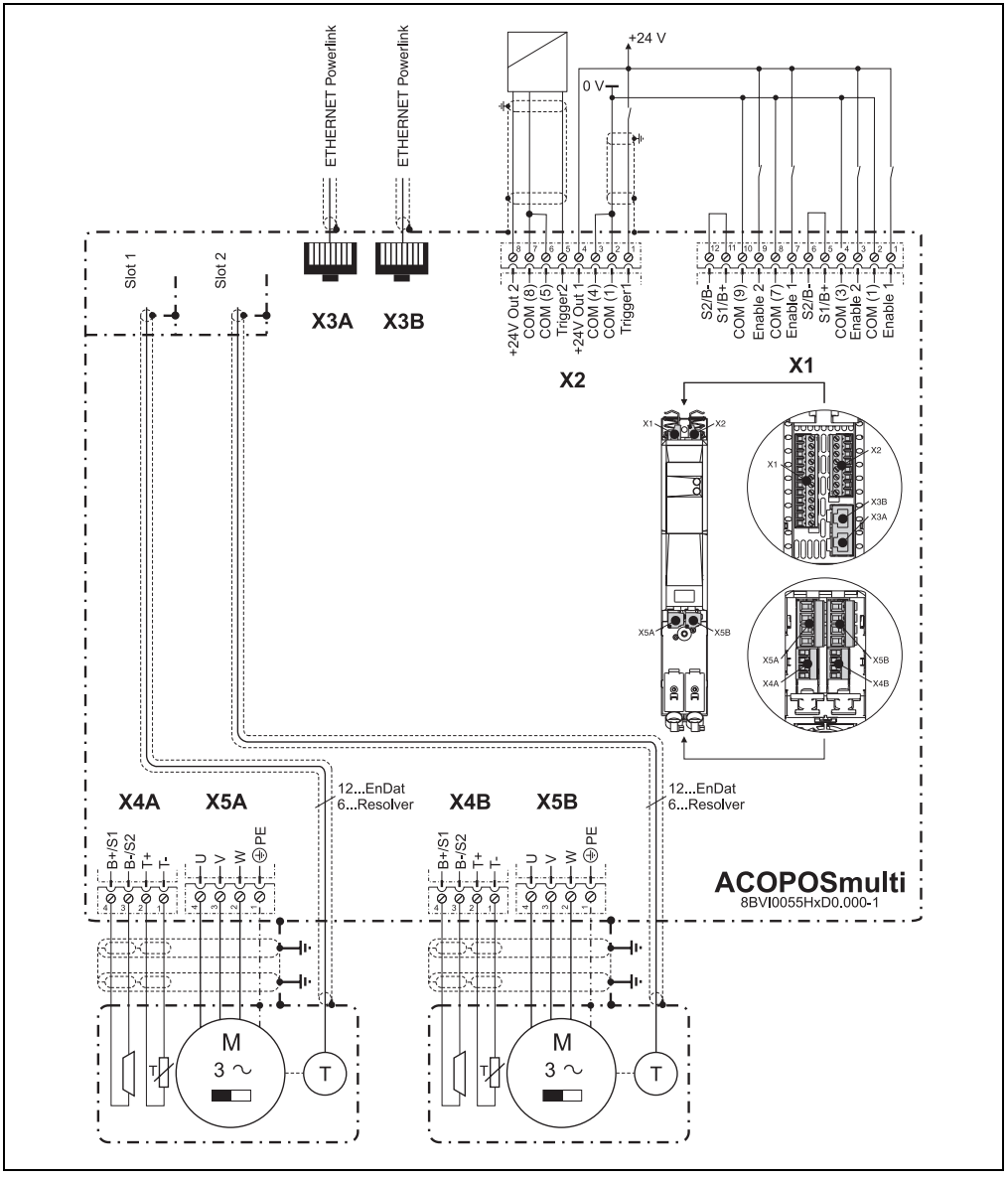


Figure 53: Overview of pin assignments - 8BVI0055HxD0.000-1

6.2.1 Pin assignments - X1 plug

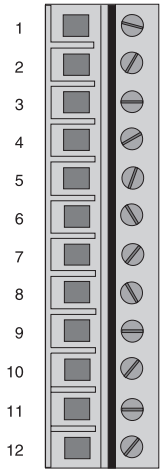
X1	Pin	Name	Function
	1	Enable 1	Axis 2: Enable 1
	2	COM (1)	Axis 2: Enable 1 0 V
	3	Enable 2	Axis 2: Enable 2
	4	COM (3)	Axis 2: Enable 2 0 V
	5	S1/B+	Axis 2: Brake + / Activation for the external holding brake
	6	S2/B-	Axis 2: Brake - / Activation for the external holding brake
	7	Enable 1	Axis 1: Enable 1
	8	COM (7)	Axis 1: Enable 1 0 V
	9	Enable 2	Axis 1: Enable 2
	10	COM (9)	Axis 1: Enable 2 0 V
	11	S1/B+	Axis 1: Brake + / Activation for the external holding brake
	12	S2/B-	Axis 1: Brake - / Activation for the external holding brake

Table 103: Pin assignments - X1 plug 8BVI0055HxD0.000-1

6.2.2 Pin assignments - X2 plug

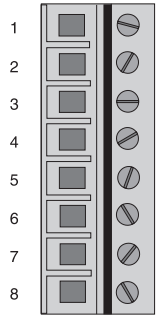
X2	Pin	Name	Function
	1	Quickstop/Trigger1	Quickstop/Trigger 1
	2	COM (1)	Quickstop/Trigger 1 0 V
	3	COM (4)	+24 V output 1 0 V
	4	+24 V Out 1	+24 V output 1
	5	Quickstop/Trigger2	Quickstop/Trigger 2
	6	COM (5)	Quickstop/Trigger 2 0 V
	7	COM (8)	+24 V output 2 0 V
	8	+24 V Out 2	+24 V output 2

Table 104: Pin assignments - X2 plug 8BVI0055HxD0.000-1

6.2.3 Pin assignments - X3A, X3B plugs

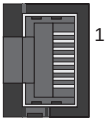
X3A, X3B	Pin	Name	Function
	1	RXD	Receive signal
	2	RXD\	Receive signal inverted
	3	TXD	Transmit signal
	4	Shield	Shield
	5	Shield	Shield
	6	TXD\	Transmit signal inverted
	7	Shield	Shield
	8	Shield	Shield

Table 105: Pin assignments - X3A, X3B plugs 8BVI0055HxD0.000-1

6.2.4 Pin assignments - X4A plug

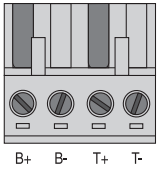
X4A	Name	Function
	T-	Axis 1: Temperature sensor -
	T+	Axis 1: Temperature sensor +
	B-/S2	Axis 1: Brake - / Activation for the external holding brake
	B+/S1	Axis 1: Brake + / Activation for the external holding brake

Table 106: Pin assignments - X4A plug 8BVI0055HxD0.000-1

6.2.5 Pin assignments - X4B plug

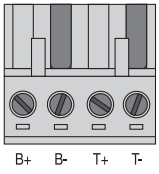
X4b	Name	Function
	T-	Axis 2: Temperature sensor -
	T+	Axis 2: Temperature sensor +
	B-/S2	Axis 2: Brake - / Activation for the external holding brake
	B+/S1	Axis 2: Brake + / Activation for the external holding brake

Table 107: Pin assignments - X4B plug 8BVI0055HxD0.000-1

6.2.6 Pin assignments - X5A plug

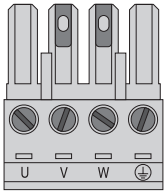
X5A	Name	Function
	PU	Axis 1: Protective ground conductor
	W	Axis 1: Motor connection W
	V	Axis 1: Motor connection V
	U	Axis 1: Motor connection U

Table 108: Pin assignments - X5A plug 8BVI0055HxD0.000-1

6.2.7 Pin assignments - X5B plug

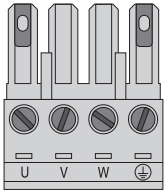
X5B	Name	Function
	PU	Axis 2: Protective ground conductor
	W	Axis 2: Motor connection W
	V	Axis 2: Motor connection V
	U	Axis 2: Motor connection U

Table 109: Pin assignments - X5B plug 8BVI0055HxD0.000-1

6.3 8BVI0880HxS0.000-1

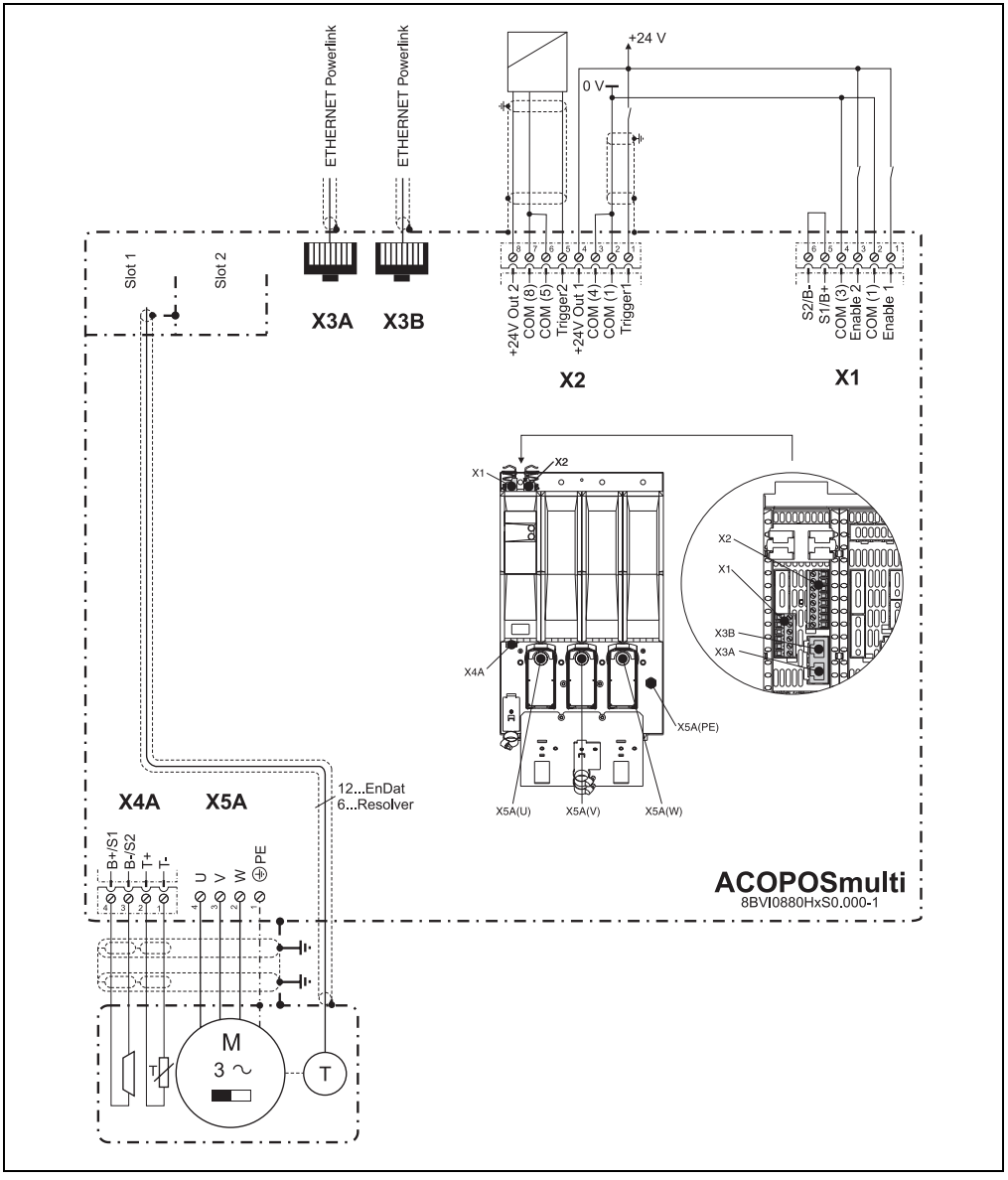


Figure 54: Overview of pin assignments - 8BVI0880HxS0.000-1

6.3.1 Pin assignments - X1 plug

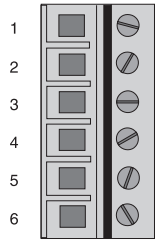
X1	Pin	Name	Function
	1	Enable 1	Axis 1: Enable 1
	2	COM (1)	Axis 1: Enable 1 0 V
	3	Enable 2	Axis 1: Enable 2
	4	COM (3)	Axis 1: Enable 2 0 V
	5	S1/B+	Axis 1: Brake + / Activation for the external holding brake
	6	S2/B-	Axis 1: Brake - / Activation for the external holding brake

Table 110: Pin assignments - X1 plug 8BVI0880HxS0.000-1

6.3.2 Pin assignments - X2 plug

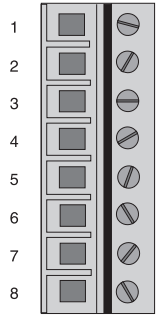
X2	Pin	Name	Function
	1	Quickstop/Trigger1	Quickstop/Trigger 1
	2	COM (1)	Quickstop/Trigger 1 0 V
	3	COM (4)	+24 V output 1 0 V
	4	+24 V Out 1	+24 V output 1
	5	Quickstop/Trigger2	Quickstop/Trigger 2
	6	COM (5)	Quickstop/Trigger 2 0 V
	7	COM (8)	+24 V output 2 0 V
	8	+24 V Out 2	+24 V output 2

Table 111: Pin assignments - X2 plug 8BVI0880HxS0.000-1

6.3.3 Pin assignments - X3A, X3B plugs

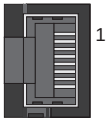
X3A, X3B	Pin	Name	Function
	1	RXD	Receive signal
	2	RXD\	Receive signal inverted
	3	TXD	Transmit signal
	4	Shield	Shield
	5	Shield	Shield
	6	TXD\	Transmit signal inverted
	7	Shield	Shield
	8	Shield	Shield

Table 112: Pin assignments - X3A, X3B plugs 8BVI0880HxS0.000-1

6.3.4 Pin assignments - X4A plug

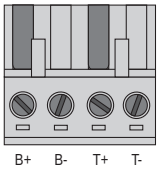
X4A	Name	Function
	T-	Axis 1: Temperature sensor -
	T+	Axis 1: Temperature sensor +
	B-/S2	Axis 1: Brake - / Activation for the external holding brake
	B+/S1	Axis 1: Brake + / Activation for the external holding brake

Table 113: Pin assignments - X4A plug 8BVI0880HxS0.000-1

6.3.5 Pin assignments - X5A plug

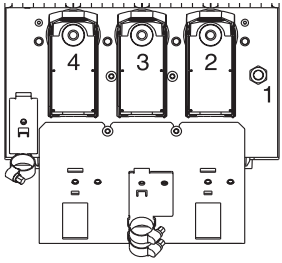
X5A	Pin	Name	Function
	1	PU	Axis 1: Protective ground conductor
	2	W	Axis 1: Motor connection W
	3	V	Axis 1: Motor connection V
	4	U	Axis 1: Motor connection U
	Holding torque for the M8 nuts: 7.5 Nm		

Table 114: Pin assignments - X5A plug 8BVI0880HxS0.000-1

Cable installation for motor connections U, V, W

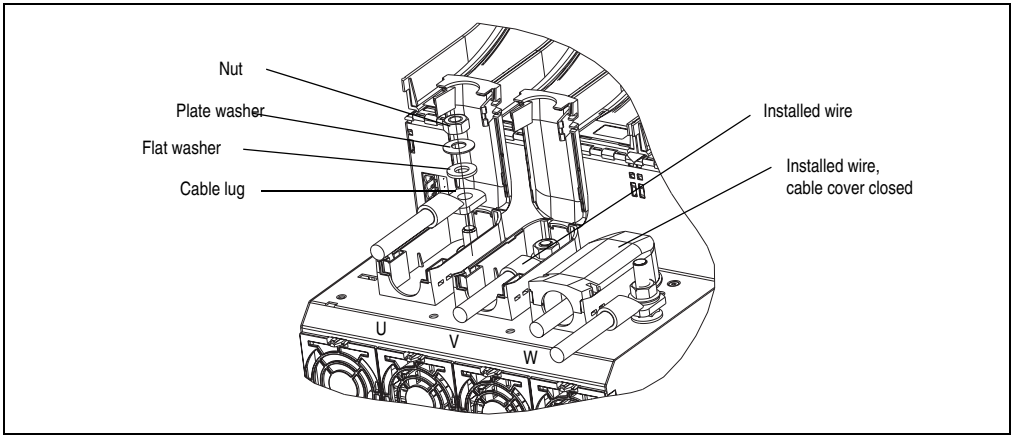


Figure 55: Cable installation for motor connections U, V, W

Cable installation connection PE (1 wire)

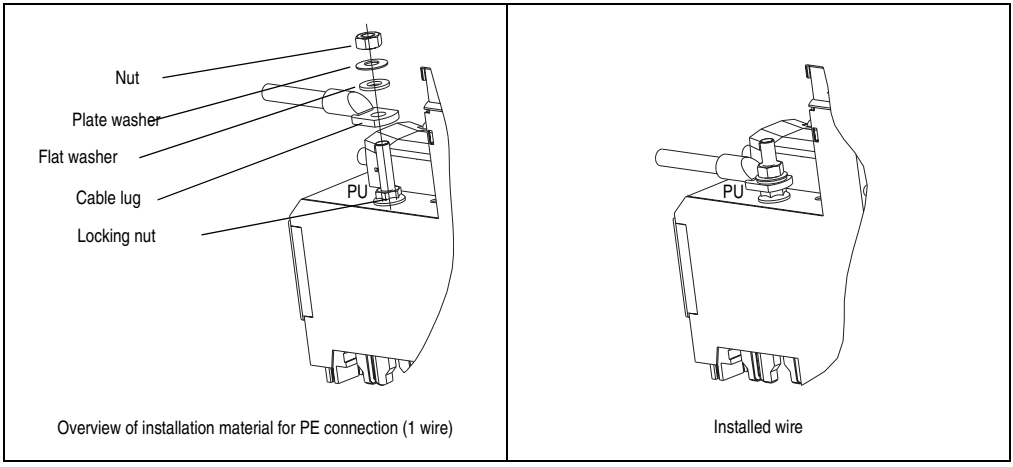


Figure 56: Cable installation connection PE (1 wire)

Cable installation connection PE (3 wire)

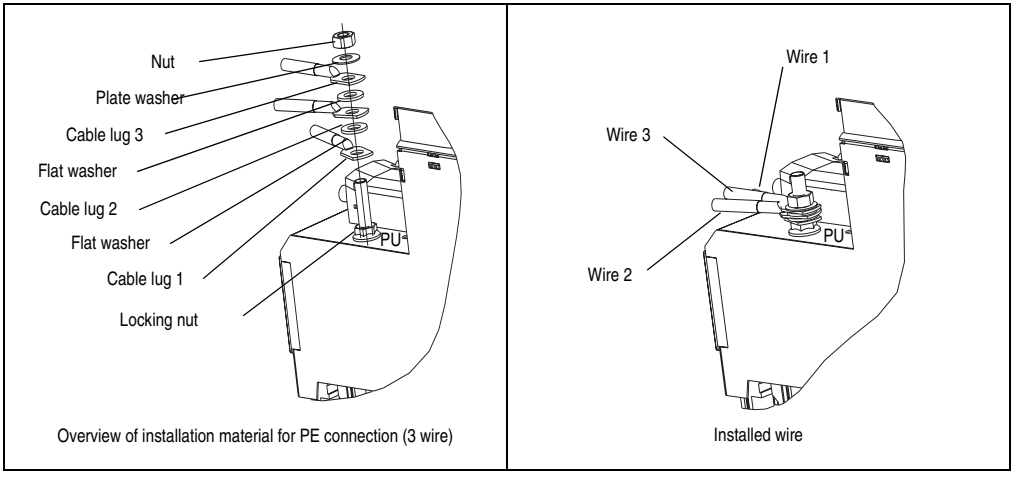


Figure 57: Cable installation connection PE (3 wire)

7. Plug-in modules

7.1 EnDat 2.1 interface 8BAC0120.000-1

7.1.1 Pin assignments

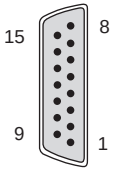
Image	X11	Pin	Name	Function
		1	A	Channel A
		2	COM	Encoder supply 0 V
		3	B	Channel B
		4	+5V	Encoder supply +5 V
		5	D	Data input
		6	---	---
		7	T+	Temperature sensor +
		8	T	Clock output
		9	A\	Channel A inverted
		10	Sense COM	Sense input 0 V
		11	B\	Channel B inverted
		12	Sense +5V	Sense input +5 V
		13	D\	Data input inverted
		14	T-	Temperature sensor -
		15	T\	Clock output inverted

Table 115: Pin assignments - EnDat 2.1 interface 8BAC0120.000-1

7.1.2 Input/output circuit diagram

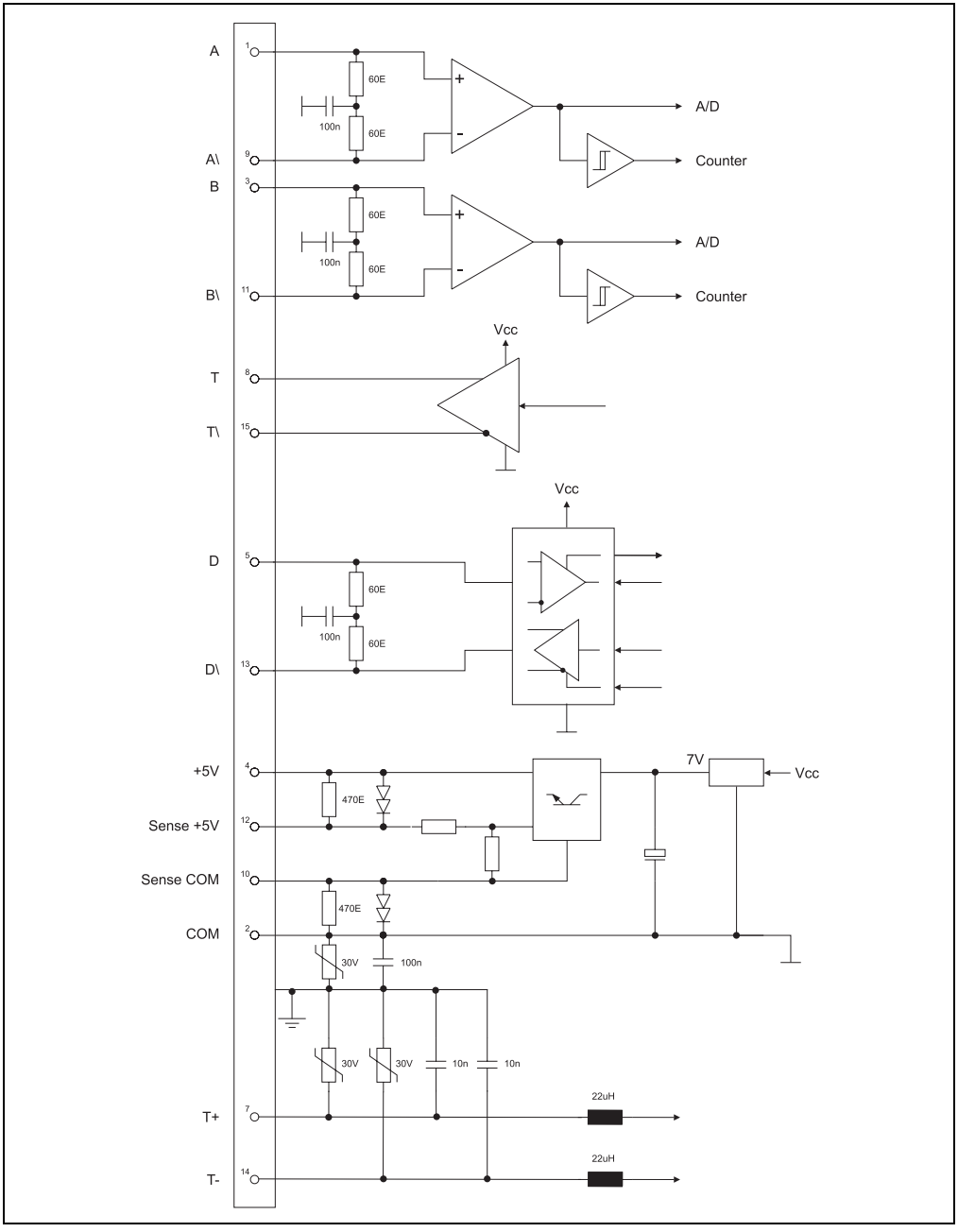


Figure 58: Input/output circuit diagram - EnDat 2.1 interface 8BAC0120.000-1

7.2 HIPERFACE interface 8BAC0121.000-1

7.2.1 Pin assignments

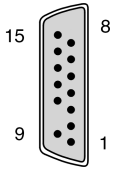
Image	X11	Pin	Name	Function
		1	SIN	Channel SIN
		2	COM	Encoder supply 0 V
		3	COS	Channel COS
		4	+10V	Encoder supply +10 V
		5	D	Data input
		6	---	---
		7	T+	Temperature sensor +
		8	---	---
		9	REF SIN	REF SIN channel
		10	---	---
		11	REF COS	REF COS channel
		12	---	---
		13	D\	Data input inverted
		14	T-	Temperature sensor -
		15	---	---

Table 116: Pin assignments for HIPERFACE interface 8BAC0121.000-1

7.3 Resolver interface 8BAC0122.000-1

7.3.1 Pin assignments

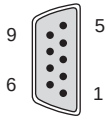
Image	X11	Pin	Name[1)]	Function	Typical wire colors for the resolver [2)]
		1	T+	Temperature sensor +	---
		2	T-	Temperature sensor -	---
		3	S4	Sine input +	Blue
		4	S1	Cosine input -	Red
		5	R2	Reference output +	black/white (or yellow/white)
		6	---	---	---
		7	S2	Sine input -	Yellow
		8	S3	Cosine input +	Black
		9	R1	Reference output -	red/white

Table 117: Pin assignments - resolver interface 8BAC0122.000-1

1) The names are the same as those used by leading resolver manufacturers (Tanagawa, Tyco, LTN).

2) This refers to the wire colors of the line connected directly to the resolver and used universally by leading manufacturers (Tanagawa, Tyco, LTN). **This does not refer to the wire colors of the B&R resolver cable!**

7.3.2 Input/output circuit diagram

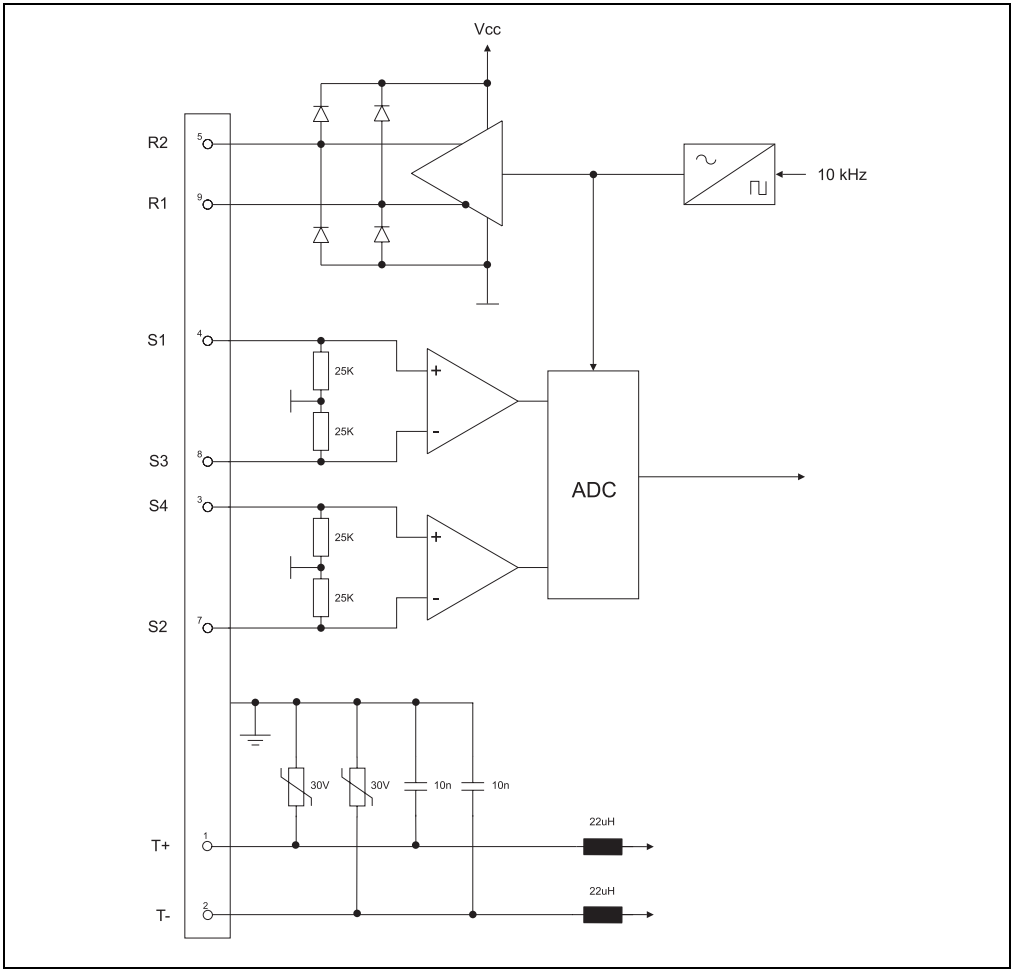


Figure 59: Input/output circuit diagram - Resolver interface 8BAC0122.000-1

7.4 SinCos interface 8BAC0124.000-1

7.4.1 Pin assignments

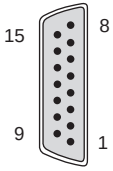
Image	X11	Pin	Name	Function
		1	A	Channel A
		2	COM	Encoder supply 0 V
		3	B	Channel B
		4	+5V	Encoder supply +5 V
		5	T+	Temperature sensor +
		6	Limit-	Negative limit (L2)
		7	R\	Reference pulse inverted
		8	Limit+	Positive limit (L1)
		9	A\	Channel A inverted
		10	Sense COM	Sense input 0 V
		11	B\	Channel B inverted
		12	Sense +5V	Sense input +5 V
		13	T-	Temperature sensor -
		14	R	Reference pulse
		15	---	---

Table 118: Pin assignments - SinCos interface 8BAC0124.000-1

7.4.2 Input/output circuit diagram

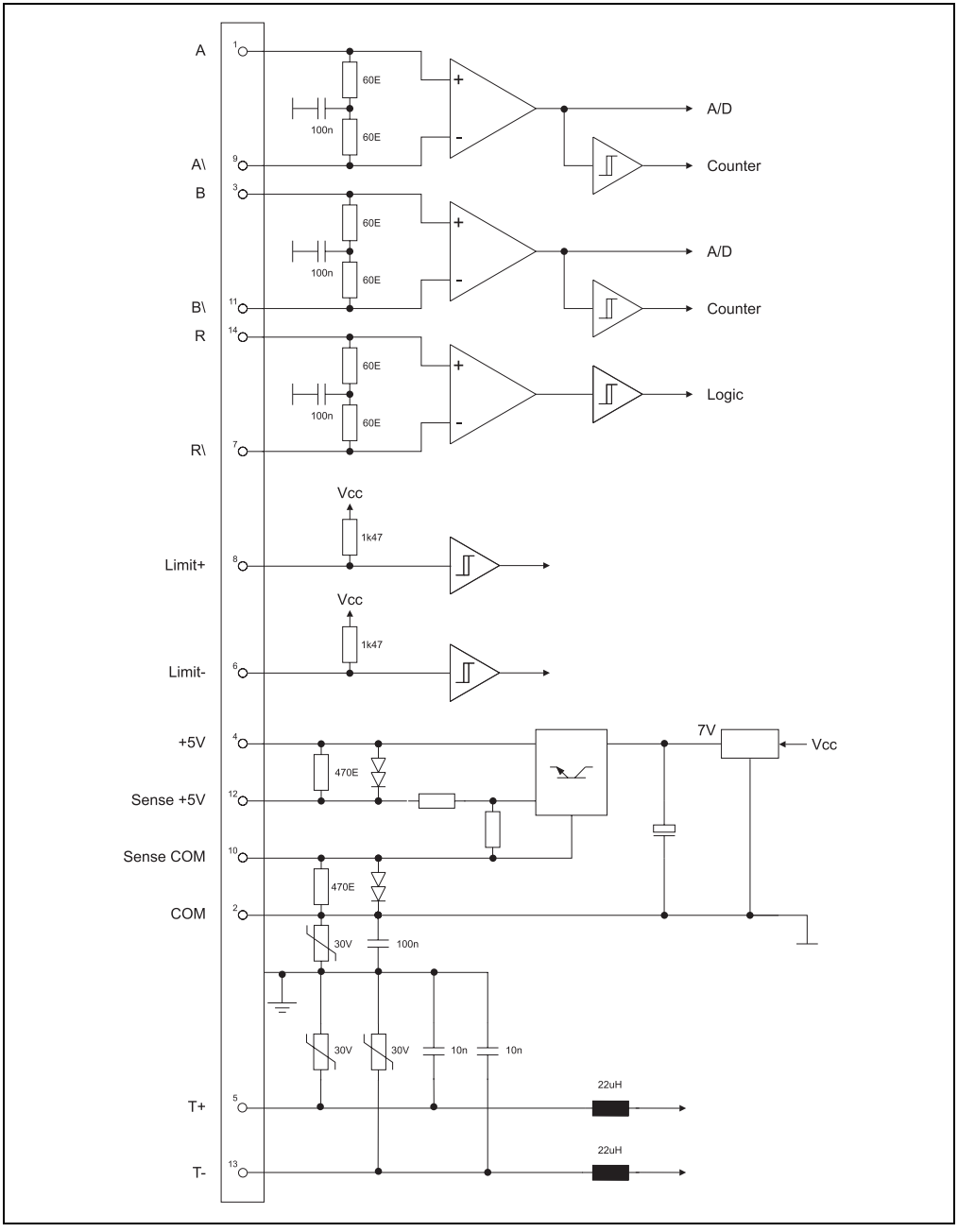


Figure 60: Input/output circuit diagram - SinCos interface 8BAC0124.000-1

8. Fan modules

8.1 8B0M0040HFF0.000-1

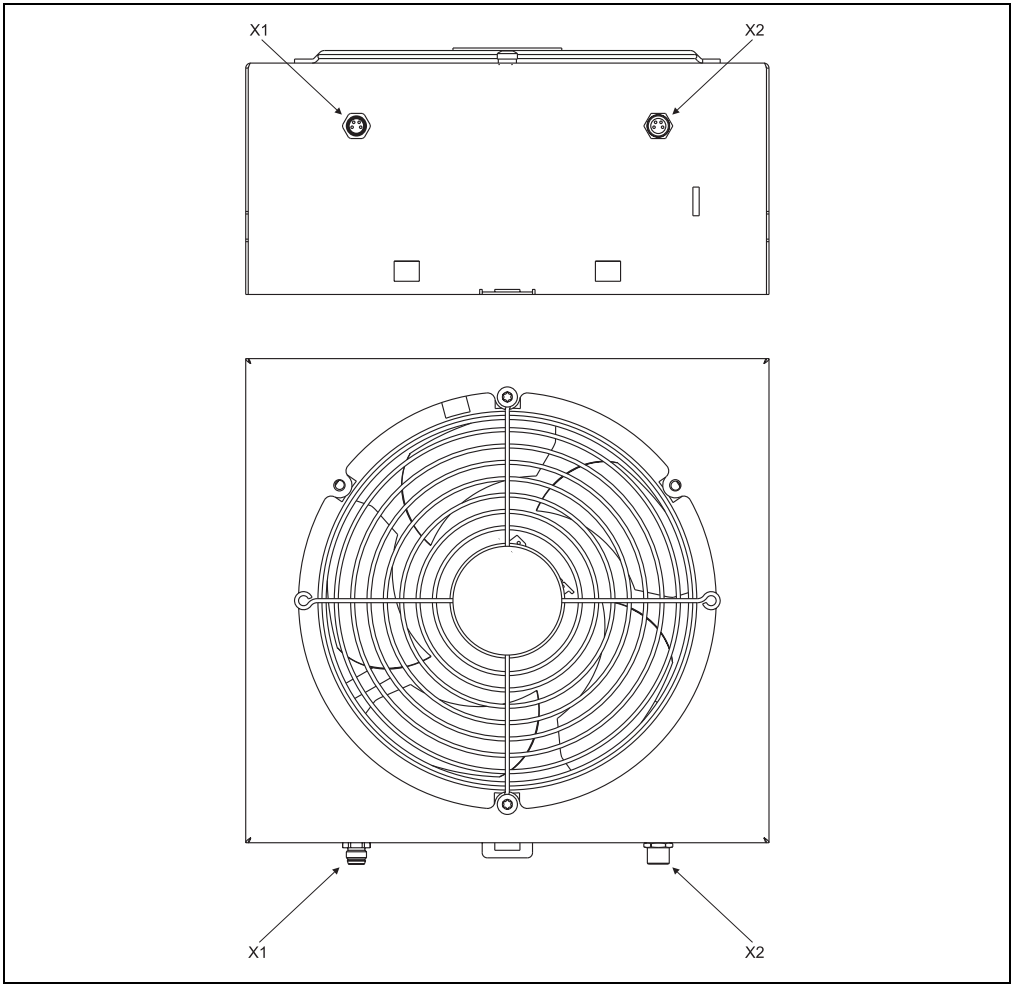


Figure 61: Overview of pin assignments - 8B0M0040HFF0.000-1

8.1.1 Pin assignments - X1 plug

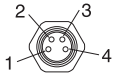
X1	Pin	Name	Function
	1	24V	Fan supply +24 VDC
	2	24V	Fan supply +24 VDC
	3	GND	Fan supply GND
	4	GND	Fan supply GND

Table 119: Pin assignments - X1 plug 8B0M0040HFF0.000-1

8.1.2 Pin assignments - X2 plug

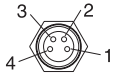
X2	Pin	Name	Function
	1	24V	Fan supply +24 VDC
	2	24V	Fan supply +24 VDC
	3	GND	Fan supply GND
	4	GND	Fan supply GND

Table 120: Pin assignments - X2 8B0M0040HFF0.000-1

Chapter 6 • Getting started

Chapter 7 • Standards and certifications

1. Valid European guidelines

- EMC guidelines 89/336/EWG
- Low-voltage guidelines 73/23/EWG
- Machine guidelines 98/37/EG

2. Valid standards

Standard	Description
IEC/EN 61800-2 : 1998	Adjustable speed electrical power drive systems • Part 2: General requirements; Rating specifications for low voltage adjustable frequency AC power drive systems
IEC/EN 61800-3 : 2004	Adjustable speed electrical power drive systems • Part 3: EMC requirements including specific test methods
IEC 61800-5-1 : 2003	Adjustable speed electrical power drive systems • Part 5-1: Safety requirements - electrical, thermal and power requirements
EN 61800-5-2: 2006	Adjustable speed electrical power drive systems • Part 5-2: Safety requirements - functional requirements
IEC/EN 61131-2 : 2003	Programmable logic controllers • Part 2: equipment requirements and tests
EN 60204-1 : 2006	Safety of machinery - electrical equipment on machines • Part 1: General requirements
IEC 61508 : 2005	Functional safety of safety related electrical/electronic/programmable electronic systems
EN 50178-1: 1997	Electronic equipment for high voltage systems
EN 1037 : 1995	Safety of machinery - prevention of unexpected start-up
EN ISO 13849-1 : 2006	Safety of machinery - safety-related parts of control systems • Part 1: General design principles
UL 508 C : 2002	Industrial control equipment • Part 6: Solid-state AC motor controllers

Table 121: Valid standards for ACOPOSmulti servo drives

The limit values specified from section 3 "Environmental limits" to section 6 "Other environmental limit values according to IEC 61800-2" are taken from product standard IEC 61800 for servo drives in industrial environments (2nd environment). Stricter test procedures and limit values are used during the type tests for ACOPOSmulti servo drives. Additional information is available from B&R.

3. Environmental limits

3.1 Mechanical conditions according to EN 61800-2

3.1.1 Operation

IEC 60721-3-3, class 3M1	
	IEC 61800-2
Vibration during operation 2 ≤ f < 9 Hz 9 ≤ f < 200 Hz	 0.3 mm amplitude 1 m/s² acceleration

Table 122: Mechanical conditions during operation

3.1.2 Transport

IEC 60721-3-2, class 2M1	
	IEC 61800-2
Vibration during transport 2 ≤ f < 9 Hz 9 ≤ f < 200 Hz 200 ≤ f < 500 Hz	 3.5 mm amplitude 10 m/s² acceleration 15 m/s² acceleration

Table 123: Mechanical conditions during transport

3.2 Climate conditions according to IEC 61800-2

3.2.1 Operation

IEC 60721-3-3, class 3K3	
	IEC 61800-2
Ambient temperature during operation	5 to 40 °C
Relative humidity during operation	5 - 85 %, non-condensing

Table 124: Climate conditions during operation

3.2.2 Storage

IEC 60721-3-1, class 1K4	
	IEC 61800-2
Storage temperature	-25 to +55 °C

Table 125: Climate conditions (temperature) during storage

IEC 60721-3-1, class 1K3	
	IEC 61800-2
Relative humidity during storage	5 - 95%, non-condensing

Table 126: Climate conditions (humidity) during storage

3.2.3 Transport

IEC 60721-3-2, class 2K3	
	IEC 61800-2
Transport temperature	-25 to +70 °C
Relative humidity during transport	95% at +40° C

Table 127: Climate conditions during transport

4. Requirements for immunity to disturbances (EMC)

4.1 Evaluation criteria (performance criteria)

Criteria A ..... Test object not influenced during test.

Criteria B ..... Test object only temporarily influenced during test.

Criteria C ..... The system does not reboot automatically (reset required).

4.2 Low frequency disturbances according to EN 61800-3

The following limits are valid for industry (2nd environment).

4.2.1 Power mains harmonics and commutation notches / voltage distortions

IEC 61000-2-4, class 3		
	IEC 61800-3	**Performance criteria**
Harmonics	THD = 10 %	A
Short harmonics (< 15 s)	1.5x continuous level	B

Table 128: Limits for power mains harmonics

IEC 60146-1-1, class 3		
	IEC 61800-3	**Performance criteria**
Commutation notches	Depth = 40%, Total area = 250% x degree	A

Table 129: Limit values for commutation notches / voltage distortions

4.2.2 Voltage changes, deviations, dips and short-term interruptions

IEC 61000-2-4, class 3		
	IEC 61800-3	**Performance criteria**
Voltage changes and deviations	± 10 %	A
Voltage changes and deviations (< 1 min)	+ 10 % to - 15 %	

Table 130: Limit values for voltage changes and deviations

IEC 61000-2-1		
	IEC 61800-3	**Performance criteria**
Voltage dips and short-term interruptions	10 % to 100 %	C

Table 131: Limit values for voltage dips and short-term interruptions

4.2.3 Asymmetric voltage und frequency changes

IEC 61000-2-4, class 3		
	IEC 61800-3	**Performance criteria**
Asymmetric voltages	3% negative component	A
Frequency change and change rate	± 2%, 1%/s (±4%, 2%/s if the power supply is isolated from general power mains)	

Table 132: Limit values for asymmetric voltages and frequency changes

4.3 High frequency disturbances according to EN 61800-3

These immunity tests are valid for industrial environments (2nd environment).

4.3.1 Electrostatic discharge

Tests according to EN 61000-4-2		
	IEC 61800-3	**Performance criteria**
Contact discharge to powder-coated and bare metal housing parts	6 kV	B
Discharge through the air to plastic housing parts	8 kV	

Table 133: Limits for electrical discharge

4.3.2 Electromagnetic fields

Tests according to EN 61000-4-3		
	IEC 61800-3	**Performance criteria**
Housing, completely wired	80 MHz - 1 GHz, 10 V/m, 80 % amplitude modulation at 1 kHz	A

Table 134: Limits for electromagnetic fields

4.3.3 Burst

Tests according to EN 61000-4-4		
	IEC 61800-3	**Performance criteria**
Power connection	2 kV, 1 min, direct coupling	B
Lines for measurement and control functions in the process environment	2 kV, 1 min	
Signal interfaces, other lines	1 kV, 1 min	

Table 135: Limits for burst

4.3.4 Surge

Tests according to EN 61000-4-5		
	IEC 61800-3	**Performance criteria**
Power connection	1 kV (2 Ω) [1], DM, symmetrical 2 kV (12 Ω) [1], CM, unsymmetrical	B

Table 136: Limits for surge

1) The impedance was added from EN 61000-4-5 because it is not defined in EN 61800-3.

4.3.5 High frequency conducted disturbances

Tests according to EN 61000-4-6		
	IEC 61800-3	**Performance criteria**
Power connection	0.15 - 80 MHz, 10 V, 80 % amplitude modulation at 1 kHz	A
Lines for measurement and control functions in the process environment		
Signal interfaces, other lines		

Table 137: Limits for conducted disturbances (radio frequency)

5. Requirements for emissions (EMC)

5.1 High frequency emissions according to EN 61800-3

These emissions tests are valid for industrial environments (2nd environment).

5.1.1 Emissions on the power connections

Tests according to EN 55011			
Continuous current on motor	**Frequency range [MHz]**	**quasi-peak value**	**average**
I ≤ 100 A	0.15 ≤ f < 0.5	100 dB (µV)	90 dB (µV)
	0.5 ≤ f < 5	86 dB (µV)	76 dB (µV)
	5 ≤ f < 30	90 dB (µV)	80 dB (µV)
100 A < I	0.15 ≤ f < 0.5	130 dB (µV)	120 dB (µV)
	0.5 ≤ f < 5	125 dB (µV)	115 dB (µV)
	5 ≤ f < 30	115 dB (µV)	105 dB (µV)

Table 138: Limits for emissions on the power connections

5.1.2 Electromagnetic emissions

Tests according to EN 55011	
Frequency range [MHz]	**quasi-peak value**
30 ≤ f ≤ 230	40 dB (µV/m), measured at distance of 30 m [1)]
230 < f ≤ 1000	50 dB (µV/m), measured at distance of 30 m[1)]

Table 139: Limits for electromagnetic emissions

1) The limit values were increased by 10 dB (µV/m) when measuring from distances of 10 m.

6. Other environmental limit values according to IEC 61800-2

	IEC 61800-2
Degree of pollution according to IEC 61800-2, 4.1.2.1.	2 (non-conductive material)
Over-voltage category according to IEC 60364-4-443:1999	II
Protection according to IEC 60529	IP20
Reduction of the continuous current at installation altitudes over 500 m above sea level	10 % per 1000 m
Maximum installation altitude	2,000 m[1)]

Table 140: Additional environmental limits

1) Additional requirements are to be arranged with B&R.

7. International certifications

B&R products and services comply with applicable standards. They are international standards from organizations such as ISO, IEC and CENELEC, as well as national standards from organizations such as UL, CSA, FCC, VDE, ÖVE, etc. We give special consideration to the reliability of our products in an industrial environment.

Certifications	
USA and Canada	All important B&R products are tested and listed by Underwriters Laboratories and checked quarterly by a UL inspector. This mark is valid for the USA and Canada and simplifies certification of your machines and systems in these areas.
Europe	All harmonized EN standards for the valid guidelines are met.
Russian Federation	GOST-R certification is available for the export of all B&R ACOPOS servo drives to the Russian Federation.

Table 141: International certifications

8. Standards & definitions for safety techniques

Stop Functions according to IEC 60204-1/11.98 (electrical equipment for machines, part 1: general requirements)

The following three stop function categories exist:

Category	Description
0	Stop by immediately switching off the power to the machine drive elements (i.e. uncontrolled stop).
1	A controlled stop, the power to the machine drive elements remains on until the stop procedure is completed. The power is switched off after the stop is complete.
2	A controlled stop, the power to the machine drive elements is not switched off.

Table 142: Overview of stop function categories

The necessary stop functions must be determined based on a risk evaluation for the machine. Stop functions in category 0 and category 1 must be able to function regardless of the operating mode. A category 0 stop must have priority. Stop functions must have priority over assigned start functions. Resetting the stop function is not permitted to cause a dangerous state.

Emergency stops according to EN 60204-1/11.98 (electrical equipment for machines, part 1: general requirements)

The following requirements are valid for emergency stops in addition to the requirements for the stop functions:

- It must have priority over all other functions and operations in all operating modes.
- The power to the machine drive elements which can cause a dangerous state must be switched off as quickly as possible without creating other dangers.
- Resetting is not permitted to cause a restart.

Emergency stops must be category 0 or category 1 stop functions. The necessary stop function must be determined based on a risk evaluation for the machine.

For emergency stop function in stop category 0, only hard wired, electromechanical equipment can be used. Additionally, the function is not permitted to depend on electronic switching logic (hardware or software) or the transfer of commands via a communication network or data connection. [1)]

1) In accordance to the national foreword for the valid German version of EN 602041-1/11.98, it is determined that electronic equipment (and also especially for emergency stop systems) can be used regardless of the stop category, if e.g. it provides the same safety using the standards EN 954-1 and/or IEC 61508 as required by EN 60204-1.

When using a category 1 stop function for the emergency stop function, it must be guaranteed that the power to the machine drive elements is completely switched off. These elements must be switched off using electromechanical equipment [1] .

Safety category according to EN 954-1/03.97 (safety of machines - safety related parts of control systems, part 1: general design principles) [2]

The safety related parts of control systems must meet one or more of the requirements for five defined safety categories. The safety categories define the required behavior of safety related controller parts regarding their resistance to errors.

Safety category (according to EN 954-1)	Safety integrity level - SIL (according to IEC 61508-2)	Short description	System behavior
B	---	Safety related parts must be designed and built so that they can meet the expected operational requirements. (No specific safety measures are implemented.)	**Caution!** **An error can cause the safety function to fail.**
1	1	Safety related parts must be designed and built so that only reliable components and safety principles are used. (e. g. preventing short circuits by using sufficient distances, reducing the probability of errors by over-dimensioning components, defining the failure route - closed-circuit current principle, etc.)	**Caution!** **An error can cause the safety function to fail.**
2	1	Safety related parts must be designed so that their safety functions are checked in suitable intervals by the machine controller. (e. g. automatic or manual check during start-up)	**Caution!** **An error between checks can cause the safety function to fail. If the safety function fails, it will be recognized during the check.**
3	2	Safety related parts must be designed so that individual errors do not cause the safety function to fail. Individual errors should - if possible - be recognized the next time (or before) the safety function is required.	**Caution!** **The safety function remains active when an error occurs. Some, but not all errors are recognized. A buildup of errors can cause the safety function to fail.**
4	3	Safety related parts must be designed so that individual errors do not cause the safety function to fail. Individual errors must be recognized the next time (or before) the safety function is required. If this type of recognition is not possible, a buildup of errors is not permitted to cause the safety function to fail.	**Information:** **The safety function remains active when an error occurs. Errors are recognized in time to prevent the safety function from failing.**

Table 143: Safety category overview

1) In accordance to the national foreword for the valid German version of EN 602041-1/11.98, it is determined that electronic equipment (and also especially for emergency stop systems) can be used regardless of the stop category, if e.g. it provides the same safety using the standards EN 954-1 and/or IEC 61508 as required by EN 60204-1.

2) To prevent confusing EN 951-1 categories with EN 60204-1 stop categories, the term "safety categories" was used in the text shown above for EN 954-1 categories.

Selecting the suitable safety category must be done separately for each ACOPOS servo drive (or for each shaft) based on a risk evaluation. This risk evaluation is a part of the total risk evaluation for the machine.

The following risk graph (according to EN 954-1, Appendix B) provides a simplified procedure for risk evaluation:

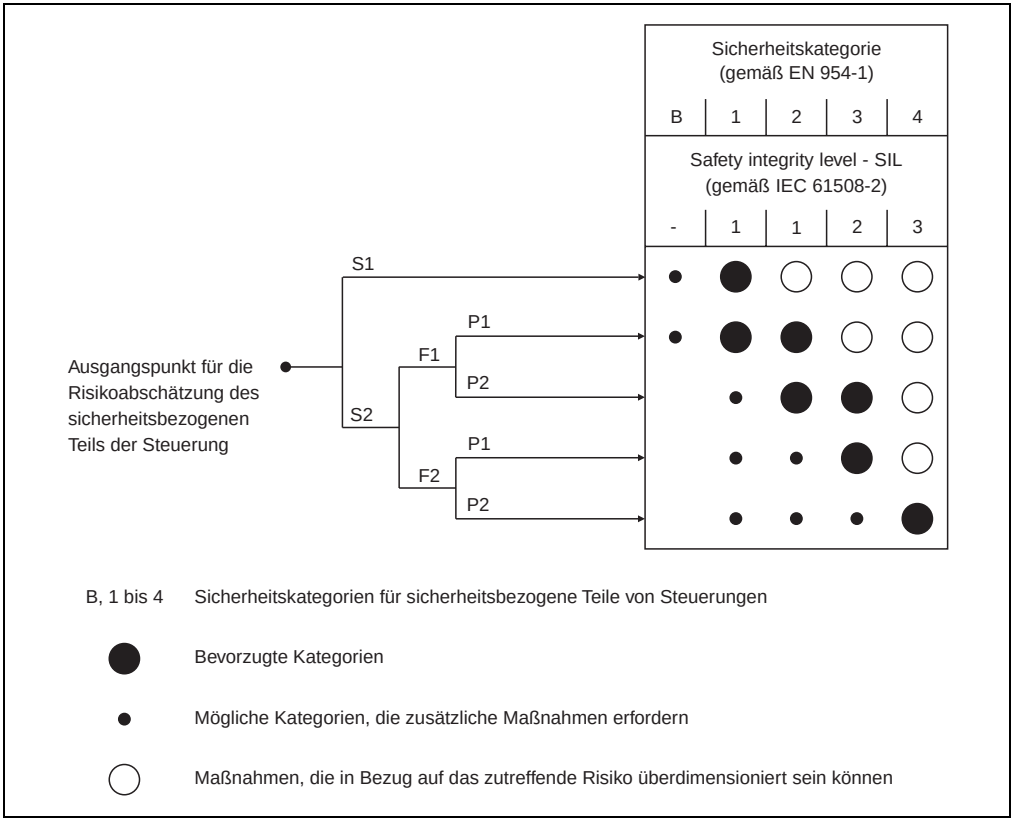


Figure 62: Risk graph according to EN 954-1, Appendix B

Begin at the starting point shown and follow the parameters S, F and P to the safety category to be used.

Parameter S ... Seriousness of injury	
S1	Light (usually reversible) injury.
S2	Serious (usually irreversible) injury.
Parameter F ... Frequency and/or duration of the danger exposure	
F1	Seldom to slightly more frequent and/or short exposure duration.
F2	Frequent to continuous and/or long exposure duration.

Table 144: Parameters S, F and P lead you to the safety category to be used

Parameter S ... Seriousness of injury	
Parameter P ... Possibility to prevent danger	
P1	Possible under some conditions.
P2	Nearly impossible.

Table 144: Parameters S, F and P lead you to the safety category to be used (cont.)

Restart inhibit according to EN 1037/04.96 (Safety of machinery - prevention of unexpected start-up)

Keeping a machine in an idle state when people are working in the danger zone is one of the most important requirements for safe operation of machines.

Starting refers to the transition of a machine or its parts from an idle state to moving state. Any start is unexpected if it is caused by:

- A start command sent because of a controller failure or because of external influences on the controller.
- A start command sent because of incorrect operation of a start element or another part of the machine.
- Restoration of power supply after an interruption.
- External/internal influences on parts of the machine.

To prevent unexpected starting of machines or parts of machines, power should be removed and dissipated. If this is not practical (e. g. frequent, short work in danger zone), other measures must be taken:

- Measures to prevent random start commands.
- Measures to prevent that random start commands cause unexpected starting.
- Measures to automatically stop dangerous parts of the machine before a dangerous situation can be caused by unexpected starting.

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